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OPPORTUNITY STOPS KNOCKING AND WALKS RIGHT IN.

The Water-Meter as a Plumber's Opportunity.

Old-time school text-books used to harp upon the statement "Opportunity knocks but once at your door." Railways were scarce then; the interurban service of electric cars was unknown; the telegraph and telephone were vaporings of the wild-eyed enthusiast.

Opportunity today has a large family and the numerous young Opportunities no longer knock at the door, but lift the latch and walk right in. At no time in the history of mankind have they presented themselves with such persistence.

One of the chief opportunities of the modern plumber is the development of the water-supply of his town or city. The water-supply problem is of the utmost importance, alike to the smallest active hamlet and the thriving and rapidly extending metropolis. The problem is of equal importance to each, the difference being only one of proportion. The plumber in either should be thoroughly conversant with all the details of water distribution, purification and conservation and should also have a comprehensive idea of the intimate relation of water-supply to sewage and sanitation.

The distribution of water on the earth amounts to seven-tenths. About seven-tenths of the human body is water. The analogy in water-distribution in the human being and the world he inhabits should induce studious consideraton. The study will convince us unquestionably of the vital importance of an adequate town or city water-supply and distribution.

The water should not only be plentiful, but it should be as pure as procurable. Being plentiful and pure, it should be distributed and used without waste.

Few towns need education as to the advantages of water-usage. Quite a number are still lax in their care of the purity of the water they use, this being evidenced by their high death-rates.

The chief crime of water-usage today is the waste that goes on, unheeded, of this precious fluid.

Slowly the nation is being taught its negligence in this regard. Plumbers, the most interested of any in the matter, should take active part in this teaching. The waste must be stopped. When we are better educated nationally it will never occur.

The remedy is the installation of a water-meter on every tap.

A short-sighted objector remarked to us that plumbers would not obtain the work of installing the meters and therefore he did not see how much attention could be given to this subject by the plumbers. It never occurred to him that if the water-supply sufficient for 1,000 people was utilized by 100 of them, that the plumber would stand a poor show of doing plumbing work for the other 900.

Supposing now, that the plumber in this case had supplied the 100 with pipes, toilet and bathrooms and other sanitary accessories. By reading an editorial of this kind, he becomes possessed of the knowledge that these 100 people are wasting the great percentage of their supply; that the installation of water-meters will do away with this waste; and that the water supply will then be sufficient for the needs of the other 900.

Will that plumber be interested in water-meters or not? Will he wait till some one of better education finds these things out and preaches them?

He will to the first question and he will not to the last. If he is a live one, he will hasten the day when his business may be extended by additional water-service, regardless of whether he performed the work of installing the meters or not.

If you agree this far and approve of the importance of this subject, your duty is clear. This is one of the many opportunities of this age. **More and better plumbing will be the result of water-meter establishment.**

Fifty years ago, a water-meter was practically unknown as an article of commerce. Twenty-five years ago, only one superintendent of waterworks had the courage to advocate in convention the universal metering of the water-supply. Today superintendents opposed to the meter-system are very rare. The consumer, the uneducated and ever-apprehensive public, is the barrier to its general adoption. The usage of meters by different cities has, up to the present time, been largely brought about by the aggressive missionary work of the meter-manufacturers. The work they have done is magnificent, but it is necessarily too restricted by virtue of the long odds of the fight.

Where the meter-manufacturers gain, plumbers will gain much more.

The following data will furnish you with a concrete idea of the vastness of this opportunity for intelligent campaigning and educative effort.

Lincoln, Neb., in 1897 had a flat water-rate. The daily pumpage was 3,070,000 gal. of water, supplying 3,200 services. Meters were then installed. In 1902, there were served 4,233 taps with 4,125 meters installed. The daily pumpage was 1,500,000 gal., less than one-half of the pumpage in 1897. In 1897, the town lost $16,000 on its water-system; in 1902, it gained $22,000.

In Sioux City, Ia., in 1898, with 312 meters, the pumpage was 491,911,000 gal. In 1904, with 2,317 meters serving 3,062 places, the pumpage was 426,800,867 gal. With 2,000 more meters, over 60,000,000-gal. saving was effected.

A few years ago, the city of Ottawa, Ill., was confronted with the necessity of either sinking new wells and increasing the capacity of its waterworks, or reducing the waste of water, estimated to be as great as the legitimate consumption. Investigation was made and the latter course was wisely chosen, the meters being speedily installed. Note the gratifying results.

From July 1, 1897, to Jan. 1, 1898, without meters, 103,091,805 gal. were pumped.

From July 1, 1898, to Jan. 1, 1899, with meters, only 59,215,580 gal. were pumped.

Here it is shown that with a natural increase of consumers, a saving was effected by the meters of 43 per cent in water-consumption and a further fuel-saving of 64 per cent was recorded. Nearly 44,000,000 gal. of water were thus reclaimed for the extension of water-service in the city.

Were the plumbers of Sioux City interested? Did they derive business benefits from meter-installation? They were and they did.

Flint, Mich., reduced its consumption, by meter-use, 70 per cent per tap, and saved $1,000 a year in fuel, with a 50-per cent gain in consumers in 5 years.

Leslie C. Smith, Superintendent of the Department of Public Service of the city of Cleveland, O., writing to "Domestic Engineering" on July 19, 1910, makes the following interesting statement:

"The following figures are taken from the records of our department for the years 1902 and 1908, before and after the introduction of meters as a general usage:

	1902	1908
Pumpage in gallons	25,537,000	19,050,000
Usage per capita in gallons	176	97.6

"The saving in fuel amounts to about 6,000 tons of coal."

Here we have a reduction by use of meters of over 6,000,000 gallons daily pumpage in spite of the increase of population, and a reduction in per-capita usage of 78.4 gallons.

In Chicago, the daily pumpage is 380,000,000 gal.; the population estimated at 2,225,000; daily average of water-use per capita, 125 gal. The waste of water is enormous. In many districts in summer, the pres-

sure is so lowered that people in the second and third flats have to carry water for drinking and washing purposes from the first floor. With Chicago's per-capita average of 125 gal., it is interesting to note that Sioux City, Ia., with meters, has an average of 35.3 gal.

Gloucester, England, without meters, used 32 gal. per head, for a population of 35,000; with meters now, and a population of 55,000, the per capita average is 20 gal. The water-supply average in England varies from 20 to 40 gal.

The advantages of meter-service are:

Elimination of abnormal waste.

Highest efficiency and widest distribution of water-supply.

The consumer pays only for what he uses.

Saving in operative expense.

Stability of water-service.

What is the use of preaching sanitary installations to people whose water-supply is inadequate, unreliable or inaccessible from the causes named?

How soon will you secure the contract for the plumbing on that new 12-flat building when the prospective builder discovers that owners of flat-buildings, 10 blocks nearer the pumping-station, are losing their tenants, because the water-service in the upper flats fails repeatedly in summer seasons?

That the installation of meters will bring about better plumbing is evident. A leak equivalent to 1-16-in. opening will discharge, at 40-lb. pressure, 31 gal. per hour, 744 gal. per day, or 22,320 gal. per month. The consumer, paying for the water he uses, will be the first one to call for an overhauling of his plumbinig when such excess-meterage is recorded and he will demand the best work in initial installations. Meter-companies and plumbers can advantageously work together to this end.

No man, town or city is rich enough to waste anything. Meter the water. The plumbing trade as a whole should do considerable missionary work toward securing a general use of water-meters.

FACTORY CLOSETS.*

By George W. A. Butler, Erie, Pa.

Since the range closet must go and is not allowed under many plumbing codes, or under our state law unless in a building built especially for their purpose, what is the next best for use in factories, mills and buildings, requiring a fixture of that make or several closets in batteries? Up to recently we have been allowing latrine or range-closets of the siphon-eduction type to be placed within buildings, and many have been installed throughout the city. Now wherein it has been proven in cases where these range-closets were unsanitary, I must say that in the many inspections that I have made of such closets in this city at different times, I found but very few that could be classed as unsanitary. In fact, in quite a few of the buildings that were inspected, that contained individual closets, these were found to be really what you could call unsanitary. Those of the automatic seat-action type and tank-closet make, either had the seats broken off and water shut off from that particular closet, and the adjoining one by being controlled by one stop pending repairs, or others were stopped up through tank being out of order, without water, and the excrement and paper up to flushing rim. In others, the valve refused to work and some that had been congested for days and the apartment locked waiting for repairs to be made. Again you would find some that had a direct water-supply running continuously, that it compelled the occupant to stand upon the seat or bowl to prevent getting a tidal-wave wash. Believe me, gentlemen, that the odors arising from some of these factory-toilet rooms, containing individual closets, were strong enough to make any one make a hurried departure for the outer air.

Now this is not an overestimate but an accurate description as to how we find such toilet-rooms where individual closets are used, in our semi-annual inspections without any frills or ruffles. There may be arguments to the contrary as to unsanitary conditions from other parts, but I am giving it as we find it, and I know there are others who have experience the same thing but don't care to say so.

Now, I cannot say that I have had similar experiences with the range-closet, or any where as much complaint and trouble, as I have had with the individual closet where it is used in factories and buildings where they are grouped. In one instance here in this city we have a large mill, that when the buildings were first built a few years ago, several batteries of individual tank-closets were installed in different parts of the buildings, and several weeks after the opening up of the mills, we began to receive complaints about the closets getting out of order and becoming congested, and I don't believe two weeks passed but what we have an inspector out there investigating a complaint, until finally the management decided that they would do away with the individual closets and install some other arrangements, whereby they could eliminate such trouble as they were having. They, therefore, contracted for and had installed several range-closets of the siphon-eduction type and it is very rarely, that we now receive complaints from the mills, and I have made several personal inspections there in the last year and a half, and the sanitary conditions are good.

We have trouble with the individual closets in women's apartments in all mills and factories, as it appears they are continually congesting them, as from five complaints of this kind received four are from the women's part.

Now I don't want the members to think that I don't advocate the use of the individual closet in batteries, etc., but I am of the opinion that if we declare against one type of closet as being unsanitary, we should adopt some other that would be its equal as far as sanitary conditions are concerned.

*Read at the fifth annual meeting of the American Society of Inspectors of Plumbing and Sanitary Engineers, held at Trenton, N. J., Jan. 20-22, 1910.

Clement, Carter & Co., dealers in plumbing specialties at Bangor, Me., were heavy losers in a fire which wrecked the Phillips building in that city a few days ago. The fire was due to defective wiring.

Abel P. Randall, Westerly, R. I., has been awarded the contract for installing a new steam-heating plant in the Elm-street school building in that city. The contract calls for two new boilers and the complete repiping of the building, the old plant which has done duty for the past twenty years being practically worthless.

QUESTIONS AND ANSWERS

THE LIFE OF DRAINAGE AND VENT-PIPES.

Editor "Domestic Engineering":—I enclose herewith a rough sketch of a plumbing system which was installed about 11 years ago. When the system was taken out a short time ago it was found that the wrought-iron pipes were stopped up with rust and in some places they were almost eaten up with rust to such an extent that they could easily be broken to pieces while the cast-iron pipe was nearly as good as the day it was installed. The

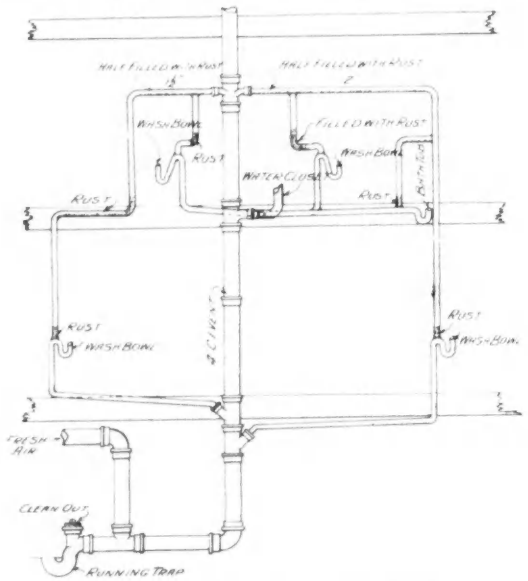


Fig. 1.—Plumbing System After 11 Years' Service.

main vent-pipe was of cast-iron, and the revent-pipes were wrought-iron. On the sketch (Fig. 1.) I have indicated where it was stopped up with rust.

This leads me to think that some of the material that is used in plumbing systems has a long life, while other material will last only a short span of years.

Before my time of working at the plumbing trade, a great deal of lead was used in such work. For instance, the vent-stack that was run out through the roof was made of lead and in every other part where lead could be utilized, it was used. But finally it was discovered that cast-iron could take the place of lead, thus making the installation a great deal cheaper, because it did not require so much time to put it in, and such a plumbing system would last long enough to suit the owner and the plumber. Later someone thought that he was going to get his plumbing cheaper by using wrought-iron, malleable iron, or steel. When the plumber would try to convince people that such a system would last only a short time, he would run up against the argument that the government was using such systems, and as a rule, he had to do the work as people wanted it.

This is my experience with piping for plumbing systems, and I would be glad to hear from others in the trade if their experiences do not run along somewhat the same lines.

I shall watch with interest your "Questions and Answers" department for comments on this question.

Yours truly,

Cedar Rapids, Ia. Chas. McHugh,
Plumbing Inspector.

ON FASTENING DOWN THE CLOSET-BOWL.

Editor "Domestic Engineering":—Some of my men seem to have trouble in getting the bowl of the closet fastened down in the proper manner. Can you give us any advice on the subject

Topeka, Kas. "Junction."

This can be quite easily regulated if our reader will observe the points following: After the hole has been cut and the lead properly flanged put the bowl to its place and mark the places where the screws will go. Then remove the bowl and put in the screws. You will have all the room necessary in which to work freely and can get the screws in vertically, a point which is almost impossible if you try to put them in with the bowl in place first. After the screws are in the bowl can be placed and the nuts put on the screws. A little observation will show just how deep to drive the screws each time.

THE COVERING OF STEAM PIPE IN A DITCH.

Editor "Domestic Engineering":—I have some steam pipe to be run in a ditch between the house and a room in the barn that it is desired to heat. The owner does not care to use the regular covering such as would be used on a large plant. Any suggestions would be welcome.

Nashville, Tenn. K. L. H.

Our friend can run the steam main in a box which can be packed with sawdust, after carefully covering the steam pipe, or he may place tile over the pipe. The latter way is somewhat troublesome and we should advise our friend that if he puts the job in the hands of any fitter to be on deck when it is under way or the job may not be made tight.

The average journeyman fitter hates to monkey with anything of the sort and generally is not any too particular as to how it is done.

MAKING THE BOILER-PIT WATER-TIGHT.

Editor "Domestic Engineering":—We have a job soon to be started, where we will have to sink the boiler, and I want to fix the pit so that it will be impossible for any water to get in and put out the fires in the spring and fall, or in case a flood should occur. Can you give me any suggestions? If so, I should be glad to see them in an early issue of your paper.

St. Louis, Mo. "Water-Tight."

We should advise you when you dig the pit to make an extra allowance for space which will be taken up by a course of crushed stone or coarse gravel. Now on this you should use tar, over which, when cold, you can put the cement bottom as usual. The sides will have to be

laid up if the pit is very deep. Some people use tarred paper in place of the tar, but we have heard of cases where it was not exactly a success. This mode of treatment refers, of course, only to the pit.

The cellar itself could be made water tight but that probably would not be in your contract.

SOME PRINCIPLES REGARDING SEWERS.

Editor "Domestic Engineering":—I have recently subscribed for your paper, and perhaps the following question has been asked before, but, if you can, I wish that you would give me in a general manner some of the most important principles in regard to the construction and the arrangement of sewers and greatly oblige one who will be

Minneapolis, Minn. A Steady Reader.

This matter is summed up very nicely in one of our publications, "The Sanitary Sewerage of Buildings," by Thomas S. Ainge, from which we draw the following points:

1. The removal of the sewage should be rapid and complete. Decomposition within the sewer would seem to indicate stagnation within or a faulty construction.

2. Thorough ventilation of the sewer to avoid the foul gasses.

3. Exclude the air of the sewer from the house and all occupied buildings.

4. The sewer should be tight in order that the liquids may not leak out and contaminate the ground, and constructed in such a way that the solid matters may be conveyed by the liquids.

5. Simplicity should govern the construction. Complicated apparatus tends to interrupt the proper working of the sewer.

6. The sewer should be constructed in the most durable manner, of the best material and put in by men who understand their business. This is a problem upon which no guessing should be allowed.

WHY DOES BRASS-PIPE SPLIT?

Editor "Domestic Engineering":—Can you tell me why the brass-pipes, that we sometimes get hold of, will frequently split?

Chicago. H. D. C.

We have looked this matter up and find that some of the reasons given are that the pipe has not been properly annealed. Another reason given is that the pipe is too hard and again it may be too light. Sometimes, it is stated, it is due to galvanic action caused by various things, such as sudden changes from heat and cold and various alkaline solutions passing through the pipes.

THE SIZE OF A WATER TAP PERMITTED.

Editor "Domestic Engineering":—Can you tell me, or will you in your "Questions and Answers" print the following question: How large a tap will any water company permit any one to make on the main? I mean how large a tap at one time?

Portland, Ore. L. H. N.

We believe that it is not customary for any water company to allow one to make greater than a ¾-in. tap. Our practical man says, however, that he has sometimes made one-inch taps on special occasions, but that he recommends that where a larger service is demanded than the usual size tapped that several taps should be made, enough to give the amount of water desired when the several pipes run are united in one. A large tap on a small main is very liable to leak even if one has the good luck to make the tap successfully.

"UP-TO-DATE" PLUMBING IN MICHIGAN.

Editor "Domestic Engineering":—I am sending you herewith a photograph of a low-down tank (See Fig. 2) which I recently pulled out on a repair job in this city. In order to obtain a good photograph of the tank, I split it open at the corner, thus obtaining a comparatively

Fig. 2.—"Up-to-Date" Plumbing in Michigan.

good view of both the front and interior. It seems to me that the tar-paper lining looks pretty natural. This low-down tank was lined with tar-paper by a firm which styles itself "Up-to-date Plumbers." I think it is quite an interesting sample of 20th-century plumbing and have no doubt that it will interest some of your readers.

Cheboygan, Mich. S. Brams.

MANNER OF MAKING STEAM-CONNECTIONS ON THE MAIN.

Editor "Domestic Engineering":—I would like to know it it makes any difference in the working properties of a job if, where you go out of the steam-main, you take it on a 45 angle rather than to connect directly from the top of the main? We recently had an argument on the question and, if you can, I wish that you would cite us some authority on the point.

Philadelphia. D. H. S.

It is stated that it is better practice to follow the 45 angle method and not to take the steam directly from the top of the steam main, because, when the latter method is made use of, the condensation drops directly into the steam supply saturating and cooling it. This matter is

treated fully in "Practical Steam and Hot-Water Heating and Ventilation," by Alfred G. King, for sale in "Domestic Engineering's" book department.

HOW C. H. D. WOULD CURE THE HAMMOND JOB.

Editor "Domestic Engineering":—Referring to a hot-water job which balks, by D. V., Hammond, Ill., if your correspondent will run a ⅜-in. pipe from the high point above boiler to tank in attic to act as an air cut, and see that there is a slight rise towards boiler on each horizontal pipe marked "X" on sketch (Fig. 3), his troubles will

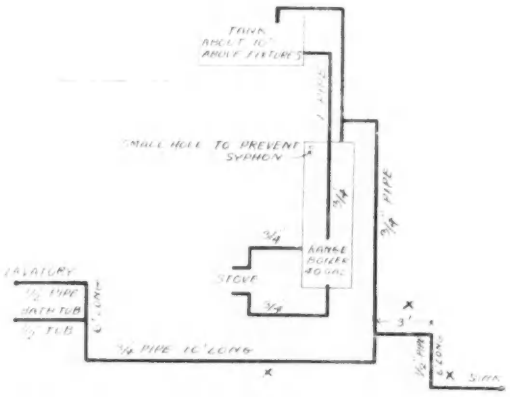


Fig. 3. How C. H. D. Would Cure the Hammond Job.

disappear. The reason for the trouble is that water contains air which is given off when the water is heated, and being lighter than water rises to the highest point and forms an air-lock. There is not sufficient head of water from his attic-tank to force this air-lock. This air-lock is seldom found in a city-pressure system unless the pressure is very low.

Bellevue, O. C. H. D.

THE COVERING OF HOT-AIR FURNACE PIPES.

Editor "Domestic Engineering":—Will you be kind enough to tell me, if you consider that the one thickness of asbestos, which the tinner generally pastes around the hot-air pipe, is sufficient?

"56"

We are not hot-air experts, but we should figure that it was not and that in addition to the asbestos paper mentioned several other thicknesses of paper, even if it were only newspapers, would add very materially to the effectiveness of the aforesaid hot-air pipe. The heating pipes that we have felt on hot-air furnaces have felt fully as hot with the one thickness of asbestos paper on, as simply the bare tin itself. If the cellar is damp the asbestos paper will draw the moisture and tend to rust the tin pipe unless it has been painted first, before the paper has been put on.

THE NUMBER OF FIXTURES ON A FOUR-INCH PIPE.

Editor "Domestic Engineering":—Will you kindly tell me the number of bath-room fixtures that can be put on a four-inch soil pipe?

Indianapolis, Ind. J. M. P.

As there is as yet no universal code the number of bath-room fixtures varies in the different cities. Also, some fixtures are counted as using more water than others. In some cases a water closet is figured as equaling two other fixtures. With this in mind one can draw his own conclusions from the following: In one city the number of closets allowed on a four-inch line above the basement is four; in another it is from one to twelve; in a different city, from one to six, and in still another city the number of fixtures allowed is from one to thirty.

We should consider that the grade, the amount of water available daily, and the size of the main sewers, besides several other points, would have to be taken into consideration in working out the problem.

A WELL USED AS A CESSPOOL.

Editor "Domestic Engineering":—A customer of mine, for whom I am soon to put in a job, wishes me to lay the drain into an old well as it has not been used for several years. What do you think of the proposition?

Indiana. J. K.

We think, if you are unable to convince your customer that he should not do such a thing, that you had better pass up the job rather than be a party to such a sanitary crime. Who knows into what underground stream that well may drain and the extent of territory that it may poison if you use it as a cesspool? If you so connected the bath-room outfit to the well you might be the one who would, with the owner, be responsible for an outbreak of fevers in some household or community miles away and cause much suffering and sickness. No, we would not take jobs like that, not even if we had to sell "crackerjack" on the street corners. Use a septic tank or try irrigation.

REGARDING THE BOILER FOUNDATION.

Editor "Domestic Engineering":—Is the heating contractor expected to furnish the foundation for the boiler?

I. X. L.

We are rather at a loss here and wish that we had more to draw to. From the question we take it that if "I. X. L." is in the business he has been in the habit of doing his work without any contract and has been where they do not furnish such things as specifications. Otherwise he would know that such a matter as the foundation is generally mentioned in such papers. If we were in the contracting end of the business we should very much prefer to make our own foundation for the boiler and we would make it a good one, even if we had to furnish it free. On the average smaller job it can be done in about an hour's time, the brick can generally be found near at hand (especially if it is a new building) and a sack or two of cement is not going to "break" you entirely. Don't get "peevish" about such small matters, but put your time and thought to making a good job rather than standing out about such small matters.

NEBRASKA PLUMBERS FORM ORGANIZATION.

The Nebraska Master Plumbers' Association was organized at a meeting held Saturday afternoon, July 9th, at the Henshaw hotel, Omaha, Neb. The officers of the new organization are: President, F. C. Phillips, Lincoln; secretary, J. B. Cunningham, Omaha; treasurer, F. W. Barclay, Beatrice. Arrangements were made at the meeting for a state convention to be held in Omaha next winter, where it is expected that 125 master plumbers will be in attendance.

A PRACTICAL MANUAL OF STEAM & HOT-WATER HEATING

BY EDWARD RICHMOND PIERCE

SECTION XII.

To determine probable value of indirect radiator-surface of average cast-iron extended-surface radiators per square foot of catalog-surface per hour.

The indirect radiator heats by contact only and the heat given off is influenced by the velocity with which the air is moving over, or coming into contact with the heated surface of the radiator.

The detailed formula for determining the B. t. u. is too long for insertion here.

The constant factor is found to be 0.09825.

This is multiplied by the velocity at which the air is moving. It is found that at the low temperature of 2-lb. pressure at boiler that a velocity of 2 to 4.5 ft. per sec is as much as is safe to figure on for average indirect work. To get indirect-radiator value, multiply 0.09825 by 3.25, average velocity, to 4.5 and that sum by 4.35 for 70 deg. in room and deduct 20 per cent for extended surface.

In order that the manner of getting the B. t. u. value of indirects may be carried out along the same lines observed for directs (see page 127 and Table FF), it may be explained that an indirect radiator heats the air by contact only; this air is then conveyed to the room which is to be heated, the air in the room itself not coming into direct contact with the radiator at all.

With direct-radiator heating, the air of the room is heated by direct contact and by radiation also, that is, by convection and radiation.

Because of this difference in method of heating it is evident that the direct radiator must be the more efficient per square foot.

We found the value of the direct 3-column radiator to be 1.6 B. t. u. per deg. of difference between the room and steam in the radiator.

We find by experiment that the indirect radiator must be figured to yield 0.805 B. t. u. per degree of difference between temperature of steam in radiator at 2-lb. at boiler and the temperature of room at 70 deg. F. for the best grade of indirect with air moving at an average of three and one-quarter feet per second.

There are indirects on the market that can not be figured higher than 0.696 per degree of difference between room and steam temperatures.

With 2-lb. pressure at boiler good cast-iron indirects can be expected to yield 111 B. t. u. per sq. ft. per hour, although some types may not yield over 96 B. t. u. per sq. ft. per hour (0.696 x 138 = 96). As the pressure increases, the value of the heating surface increases the same as with direct surface.

As the pressure increases the velocity may also increase to some extent. But in house-heating it is not usually wise to allow for a greater velocity than four and one-half feet per second.

The B. t. u. emitted by average indirect radiators per square foot per hour with an average velocity of 3.25 ft. per sec. in moving air is approximately as follows at different pressures.

TABLE S.

Probable number B. t. u. emitted per sq. ft. per hour from average cast-iron indirect radiators. Boiler pressure 2-lb. to 15-lb. Temperature room, 70 deg. Velocity, 2 ft. per sec. to 4.5 per sec. For residence work, average 3.25 ft. per sec.

Lb. Pressure at Boiler.	Diff. Temperature Between Room and Radiator.	B. t. u. Per Deg. Difference in Temperature.	B. t. u. Value Per Sq. Ft. Per Hr.
2 lb.	138	.805	111
5 lb.	145	.814	118
10 lb.	157	.828	130
12 lb.	162	.834	135
15 lb.	168	.839	141

It is not the intention to take up ventilation in this work. This is a subject intimately connected with heating, to be sure, but is also an independent branch of the work not usually undertaken by house-heating steam-fitters except upon specially prepared specifications.

But as occasion might arise where the residence-heating steam-fitter might find it desirable to figure out for himself other velocities than that given in Table S it is thought well to explain that table more fully. When the constant 0.09825 is multiplied by the given velocity of 3.25 ft. per sec. (this being the average) the result is .319. This multiplied by the number of heat units emitted from the radiator to the moving air, 435 B. t. u. per hour at the temperature of 138 deg. difference between the room and the surface of the radiator, gives the room-heating value of the prime surface of the radiator. But, as 20 per cent of the average cast-iron indirect radiator as cataloged is extended surface, it is necessary to deduct that much from the cataloged surface and to save error it is well to do so at this point. The process is in full 0.09825 x 3.25 = .319 x 435 = 139 — 20 per cent = 111 B. t. u.

The same method should be employed for other velocities and pressures. Table SS shows the heat units emitted to the incoming air per hour at different temperatures within the range of present practice in indirect house-heating by the radiators.

TABLE SS.

Pressure at Boiler.	Temperature of Radiator.	Difference Between Room and Radiator.	Heat Units Emitted to Moving Air Per Sq. Ft. Per Hr.
2 lb.	208	138	435
5 lb.	215	145	462
10 lb.	227	157	510
12 lb.	232	162	530
15 lb.	238	168	554

At 5 ft. per sec. velocity and 15-lb. pressure we would have 0.09825 x 5 = .491. This multiplied by the B. t. u. emitted from the radiator to the moving air at 15-lb. pressure = .491 x 554 = 272 B. t. u. for prime surface. Deduct the 20 per cent for extended surface cataloged and you have the value of the radiator per square foot at 5-ft. velocity per sec. in moving air as 238 B. t. u., as against 141 B. t.

u. when air has 3.25 ft. per sec. velocity. This illustration serves to show very vividly how difficult it is to get satisfactory results from simple gravity systems of indirect heating.

It is, however, at times necessary to know how much heat in B. t. u. is necessary to raise one cubic foot of air to a certain point.

The specific heat of air, 0.238, multiplied by the weight of a cubic foot of air, .0864; will give the amount required to raise one cubic foot one degree. This amount multiplied by the number of degrees to be raised will show the total. Thus .238 × .0864 = .02056 + this × by 70 = 1.4392 + B. t. u. required to raise one cubic foot of air from zero to 70 deg.

The weight of air changes slightly as it increases above zero. Therefore, at other minimum temperatures than zero, the decimal of weight per cubic foot changes. The following table T shows the values of all temperatures usually required in house-heating and domestic water-heating operations.

TABLE T.

B. t. u. Required for Heating Air.

This table specifies the units of heat required to heat one cubic foot of air at different temperatures.

Extern'l Temp.	Temperature of Air in Room									
	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°
40°	1.802	2.027	2.252	2.477	2.703	2.928	3.154	3.379	3.604	3.829
30°	1.540	1.760	1.980	2.200	2.420	2.640	2.860	3.080	3.300	3.520
20°	1.290	1.505	1.720	1.935	2.150	2.365	2.580	2.795	3.010	3.225
10°	1.051	1.262	1.473	1.684	1.892	2.102	2.311	2.522	2.732	2.943
0	0.822	1.028	1.234	1.439	1.645	1.851	2.056	2.262	2.467	2.673
10	0.604	0.805	1.007	1.208	1.409	1.611	1.812	2.013	2.215	2.416
20°	0.393	0.590	0.787	0.984	1.181	1.378	1.575	1.771	1.968	2.165
30°	0.192	0.385	0.578	0.770	0.963	1.155	1.345	1.540	1.733	1.925
40°	0.000	0.188	0.376	0.564	0.752	0.940	1.128	1.316	1.504	1.692
50°	0.000	0.000	0.184	0.367	0.551	0.735	0.918	1.102	1.286	1.470
60°	0.000	0.000	0.000	0.179	0.359	0.536	0.718	0.897	1.077	1.256
70°	0.000	0.000	0.000	0.000	0.175	0.350	0.525	0.700	0.875	1.049

Above tables from F. Schumann's "Manual of Heating and Ventilation."

The use of the above table is adapted to many purposes in heating problems.

It is often required to know how many B. t. u. will be required to raise a given number of cubic feet of air from zero to 70 deg. or some other temperature.

Let us suppose it is required to know how many B. t. u. would be needed to raise 2,800 cu. ft. of air from 20 below zero to 80 deg. above. Under 80 deg. and opposite minus 20 deg. we note that it will require 2.150 B. t. u. to raise one cubic foot of air from minus 20 deg. to 80 deg. above, then, 2800 × 2.150 = 6020 B. t. u. per hour. Or if it is desired to know how many cubic feet of air 1303 B. t. u. would heat from 20 below to 80 above, divide the 1303 by 2.150; or from zero to 70, divide 1303 by 1.439.

A great variety of occasions will occur when this table will be found of value.

From time to time there is a call for direct-indirect radiators.

This type of radiator is probably the least understood as to its requirements and limitations of any type in ordinary use.

While it is not intended to take up ventilation, it is necessary to give a little instruction regarding direct-indirect radiator use, as this form is the most difficult to handle with some degree of success of all the natural-draft systems. Yet when well proportioned is a very effective system within its limits.

The various designs of the numerous manufacturers are so startingly unlike in the amount of cold air admitted per square foot of rated surface, that until the time arrives that each manufacturer states that average quantity of air which will pass, or will give the exact free area for air to pass, through his product per section attached to cold-air box, any general rule for handling direct-indirect radiators and ventilators will be the rankest kind of guesswork.

Some have guessed 25 per cent additional, but they were using at least 15-lb. gage-pressure and some particular make of radiator that allowed a small amount of air to pass through it.

Some say 50 per cent more than for straight direct radiators. These again are correct for certain particular types of direct-indirect. With 2-lb. pressure at boiler and the average cheap direct-indirect, it is probable that from 35 to 50 per cent more than would be required for two or three-column direct radiators is not far from correct. There is at the present time but one direct-indirect radiator on the market, which, as cataloged, is worthy any serious attention. The sanitary box-base radiator, as cataloged by American Radiator Co., gives some idea of what can be expected in way of air delivered through it.

In figuring for direct-indirect, ascertain the cubic feet of air the radiator you desire to use will average to deliver per hour to room. Multiply this by 1.4 or 1.5 to get number B. t. u. required to heat the incoming air to temperature of room, or 70 deg. (See Table T, opposite 0 and under 70.) This amount is what will have to be added to the amount of direct radiating surface required.

The matter is simple as soon as the number of cubic feet of air the radiator will permit to pass through it per hour can be decided.

The amount of air which may be expected to pass through 144 sq. in. of flue is given in Table U.

TABLE U.

Cubic feet of air which may be expected to pass through a flue 144 square inches in area in one hour with a velocity of three and one-half feet per second.

Height of Flue in Ft.	Excess of temperature in flue above colder air					
	20 deg.	30 deg.	50 deg.	100 deg.	138 deg.	150 deg
1 in.	2880	3540	4560	6840	7620	7980
5 in.	6540	8040	10020	14520	17040	17880
10 in.	9180	11200	14520	20820	24000	25140

(To be continued)

BUSINESS CHANGES.

J. M. Morgan, Chillicothe, O., has sold his plumbing establishment on East Second St., to J. Stevenson and John Wisser.

P. B. Arnold's plumbing establishment at Ft. Wayne, Ind., has been removed from 724 Harrison St. to 211 E. Main St., owing to the gradual increase in business.

Ernest Decker has sold his plumbing establishment on East High street, Jefferson, Mo., to W. R. Menteer, P. H. Loethen and Carl Backers.

The plumbing firm of Moran & Schlauss, Winona, Minn., has been dissolved and Mr. Moran will hereafter conduct it under the name of the Moran Plumbing Co.

Harry S. Wright, Andover, Mass., has removed his plumbing store from the Barnard block to the Draper building, where he has much more attractive and convenient quarters.

A PLUMBER'S DIARY

BY PHOENIX

VI.

July 17.—It did not cause us very much trouble to locate the job this morning. It was the largest one the town ever had had and probably remains so to this day. We succeeded in finding the boss before he got lost for the day and we struck him hard for the job.

He told us to wait a few moments until he got the men started and that he would then have time to "examine us." So we loafed around, watching the other fellows getting out the tools and eyeing us like we were a couple of stray cats. A fellow always feels mighty uneasy under such circumstances, as if he was in the way and he wonders how he is going to "hook up" with the gang. In the course of about half an hour the boss was ready for us and he said: "Come on in to the store-room and I'll soon tell you fellows."

We followed him to the room, which I want to describe briefly:

As I looked around I saw that order or system was a thing not taken into consideration, the main point seeming to be to get as much into the room as possible. About the only clear space in the room was the place where the table stood upon which the plans were spread. Fittings, valves, bolts, hangers, and other odds and ends were hopelessly mixed.

The boss spoke up, saying: "Take a line of pipe on the plans and read it to me." I stepped up to the table and gazed at the drawings. They were on stiff colored paper each floor separate and the sheets about six feet square, the tracing being done with pencil.

Fortunately I had learned to read the "prints," and I was able after looking at the drawings for a moment or two to do as he required. Then Jim took a shot at it, and he, too, made good. He then asked us a few questions about packing valves, and if we counted the threads when we made up the "rights and lefts" upon which points we seemed to satisfy him, and then he said: "Well, fellows, you can go to work after dinner, if you want to. Come on at one and I will have some helpers here and I shall put you at separate ends of the job. There isn't much to do except to cut up the pipe and put it in place. When I ain't here and you want to know anything, you can come to this room and you will always find the plans here, for they are not allowed out of this room."

Says Jim: "Are the plans responsible?"

"What do you mean by that?" asked he. "I mean," said Jim, "will you stand back of the plans? If we put in the work according to the scale, as it shows there, does it go?"

"Of course it goes," he answered. "I drew those plans all myself and I guess I know my business."

"All you got to do is to follow those drawings, and you'll be all right." With that we went out and left the building, for we did not care to have the other fellows seeing us hanging around, as they might think that we were looking after pointers. I have noticed that the average workman don't talk much to a strange man on the job. Seems like he regarded your coming on as an intrusion and that the job wouldn't hold out so long because you were there.

"What do you think of those plans, Jim?" I said, when we were out of the building. "He must have figured so close that he couldn't pay somebody to draw them, or else he has got a swelled head and knows it all; what do you know about all those right and left couplings we saw on the lines?"

"I think that some of us will be working overtime after the test is made, caulking up the leaks," he answered.

At one that afternoon the boss started us at work, Jim at one run of main and he put me working finishing some branches and risers at the other end. The helper the boss gave me seemed like quite a decent kind of a fellow and so I said to him: "Where are the cutting tools?" "Why down in the shop at the other end," he said. "And when you want to cut up any pipe you walk a block or more," I inquired. "Well you go and scare up a vise, some wrenches, stocks and dies and we'll make a bench out here where we can have things handy."

The helper did not like it a little bit, but he went, and I chased around and got a plank and some two by fours, borrowing a saw from a carpenter and picking up a hammer that I found handy I went to work making a place to work.

In about an hour and a half we had the tools together and the bench set up and a few lengths of pipe handy on the floor near by. "Now come to the store room and pick out some fittings while I get the run of this end of the building," I said to the helper.

I took a smooth piece of board and copied from the plan several runs and branches of the job at my end of the building—enough to last me for a day's work or more and we went back to the bench.

I found the holes cut for one riser line and two or three branches to be run to some wall-radiators hung on the ceiling. So I took six or seven measurements and we went to the bench close by, to cut them up. The helper was willing and active, and we cut up the pipe in a short time, putting on at the bench the necessary fittings.

He picked up the pipes and was going to carry them to the radiators when I said: "Wait a minute, we'll work up the right and lefts." As he looked quite surprised I said: "Haven't you been doing that?" "No, we slap 'em in any way," he answered. "Well, we will work them up and we will count the threads every time we put one on," and I was showing him how to do it when the boss came along. He looked around surprised-like, but did not say anything. We put in the pipes and were getting some more measurements when the whistle blew for quitting.

G. W. McDaniel, secretary of the Church of The Brethren, Denton, Md., has asked for bids for the installation of a steam-heating plant for a concrete-block edifice; audience-room, 30x38 ft.; Sunday-school room, 26x26 ft.; 16-ft. ceiling.

Sealed proposals for the heating, plumbing and electric wiring of the County Infirmary at Brazil, Ind., will be received by the Board of Commissioners of Clay county at the office of the county auditor at Brazil, Ind., until 11 a. m. Aug. 8, 1910. The commissioners are Chris Koehler, Wm. T. Modesitt, Geo. R. Reberger.

Domestic Sanitation*

By Thos. Hughes, R. P., of Warrington.

(Continued from Page 78, July 16th Issue.)

Up to now, I have been dealing with the fresh-water-supplies of dwellings, which, although important, are only a small part of our subject. Before dealing with the foul-water arrangements, I think it would be well at this point to note that some of the objects aimed at in good domestic sanitation are to prevent the contamination of fresh water, to prevent the contamination of air, and to provide for instant removal of all waste matter.

With regard to air contamination, I mentioned just now the opinions of two eminent scientists regarding dust-impurities. In addition to dust we now know that the air is teeming with a population of minute denizens, which are known as bacteria or micro-organisms. Professor Percy Frankland tells us that four hundred millions of these organisms could be spread over one square inch, in a single layer, without any complaint of overcrowding; and that a single one of them can, in twenty-four hours, give rise to a progeny four times as numerous as the population of London! Of course, these bacteria perform very important functions in the scheme of Nature, and fortunately the greater portion of them are beneficial and necessary to human existence. Still, it is now certain that a number of them are responsible for many of the illnesses and epidemics which from time to time play havoc with whole communities who are powerless—chiefly through their own neglect—to cope with them.

It is one of the paradoxes of life that, whilst many people are most particular and would not dream of drinking polluted water, they are quite careless, and even seem willing and anxious, in respect to breathing polluted air, forgetful that one is as dangerous to their health as the other. Indeed, it is a question which is the more dangerous, seeing that the polluted air taken into the lungs is much sooner brought into contact with the blood than the water which enters the stomach.

The responsibility of having a pure air-supply rests largely upon individuals, and differs in this respect from the water supply, the purity of which most towns, thanks to their enlightened municipal action, have taken great care to provide. Ashton-under-Lyne, in particular, must be placed in the front rank of municipal enterprise for having, in addition to a pure water-supply, provided its inhabitants with pure sterilized milk, free from bacteria.

With further reference to these bacteria, their greatest number is found where waste organic matters are allowed to accumulate, the complex nature of which they attack, break up, and convert into simple substances, and during the process give rise to many of the gases known as the products of decomposition.

It is with the object of removing speedily from dwellings all waste, and preventing the gases of decomposition gaining access, that the next illustrations, constituting the interior sanitary fittings of houses, are designed.

The first (Fig. 5) illustrates the method by which an ordinary sink should be fitted. It is fixed on cantilever brackets, has the thickness at the back let into the wall, so that no ledge will exist upon which matters may accumulate; it is provided with a trap in the waste-pipe, immediately underneath; the trap is protected from being emptied by syphonic action with a ventilating-pipe that also allows of air to pass through its entire length; and it discharges the waste water through a back inlet into a gully, which serves to disconnect it from the drain.

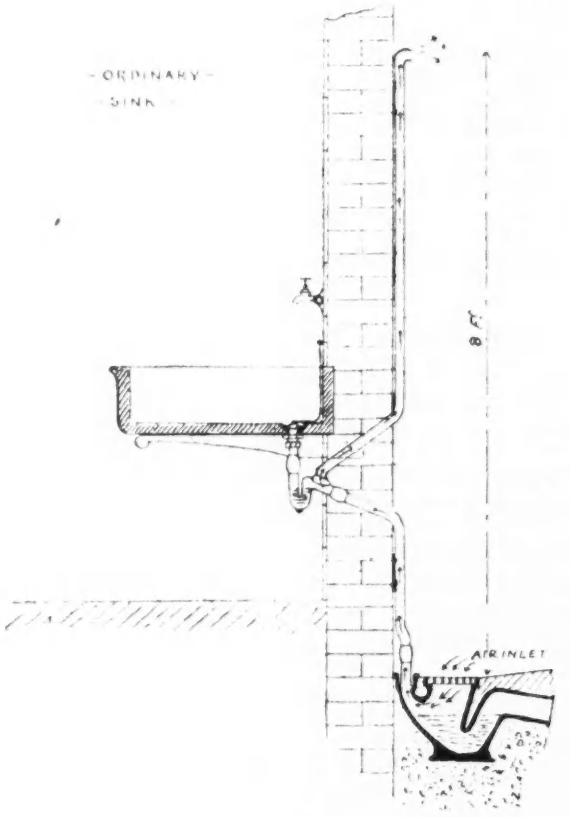


Fig. 5.

Such an arrangement allows of the instant removal of foul water, for the ventilation of the whole pipe-interior, and does not provide any place for the accumulation of material likely to decompose. The connection of the pipe to the gully is an important feature; first, because it allows of the waste water being utilized for flushing the gully, and second, because it prevents accumulations of any matter on the grating, and at the same time does not prevent air passing through its entire length.

I do not know why people still insist on these pipes discharging above the gratings, unless it is that they con-

*An illustrated lecture delivered in the Technical School, Ashton-under-Lyne, England, on December 9, 1909, under the auspices of the Manchester Council for the National Registration of Plumbers. Reproduced by courtesy of "The Plumber and Decorator."

sider it an advantage to break up the scouring force of the water, and make gully-tops into miniature refuse-heaps! I think, in view of the importance of a pure air-

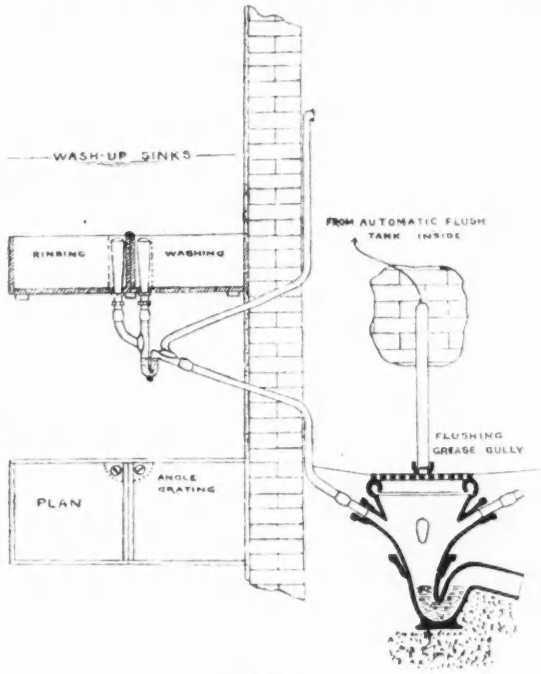


Fig. 6.

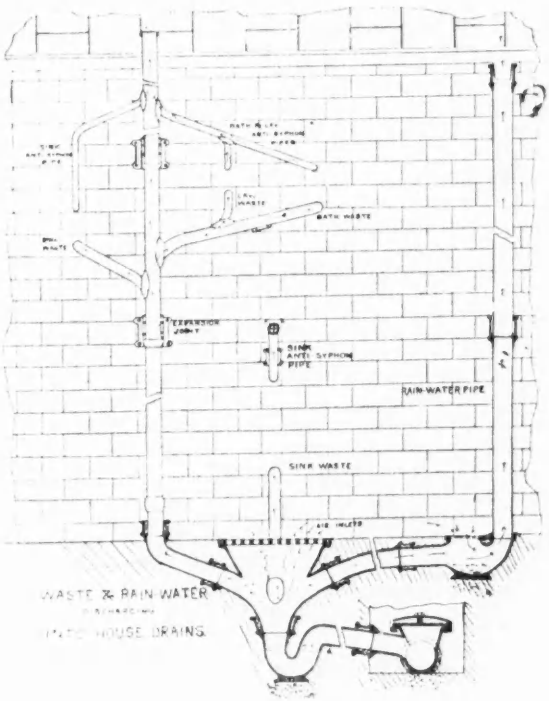


Fig. 7.

supply, that all wastes from sinks, baths, and lavatories should be treated in the manner shown in the diagram, for surely what will pass through a waste-pipe will pass through a drain.

Fig. 6 shows a pair of washing-up sinks as used in the larger houses, the waste from which is connected to a flushing grease-gully. This gully has a flushing-rim, and

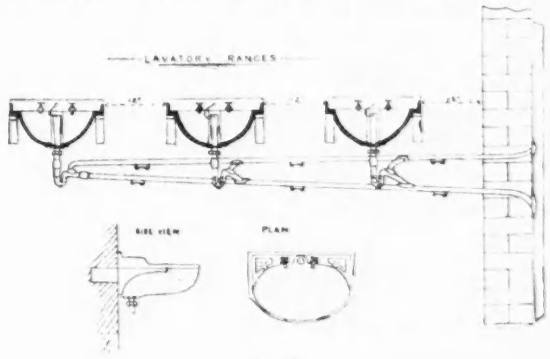


Fig. 8.

an automatic flush-cistern is connected to it for periodically removing any grease-accumulation. I do not think it good practice to put in any of the fittings which allow of accumulations of grease. Their interiors get very foul, and the gases of decomposition which are generated become most offensive.

With regard to baths and lavatories, one of the most suitable baths for general use is of the porcelain enameled-iron variety, with rolled top and a combined standing plug and overflow, if indeed any overflow from a bath is necessary. The waste-pipe should have a trap fixed immediately under the bath outlet, the trap be protected from siphonage with a ventilation-pipe, and the discharge enter a main vertical waste-pipe outside, which can also receive lavatory and sink-wastes.

Fig. 7 shows these connections to the main waste, its

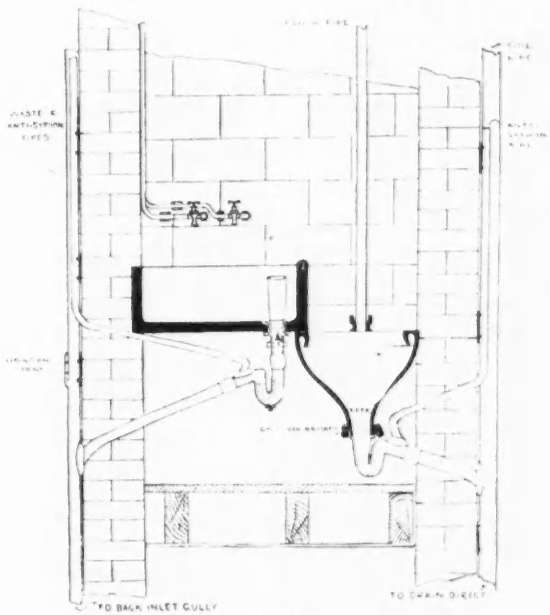


Fig. 9.

connection to the gully, and expansion-joints formed in the fixing of the pipes. The work here is shown in lead pipe, and I believe lead pipe to be the most suitable, there being little or no chemical action on it. It is easy to

bend, it does not require special junctions or fittings, and it offers a perfectly smooth interior surface to the passage of water.

There are some people who say that copper pipes should be used for this work, the contention being that they would not be affected so much by expansion and contraction when passing hot or cold water. I might go one better and say that silver pipes would do best, as they would be more proof still against expansion; but I am afraid they would "contract" so rapidly some dark night that nothing of them would be left next morning! I do not see any need for such expense as would be incurred by using copper, because the waste water after use is never at such a temperature likely to seriously damage any pipes.

Fig. 8 shows how to fix up a range of lavatory-basins. Each is fixed as a separate fitting, trapped separately, the trap protected from siphonic action, and isolated from its neighbor by a space of at least 12 inches. Such a range would meet all the requirements of modern sanitation.

I am of opinion that a range of basins placed closely side by side, where the splashing from one can enter the next, cannot be regarded as sound practice, even though

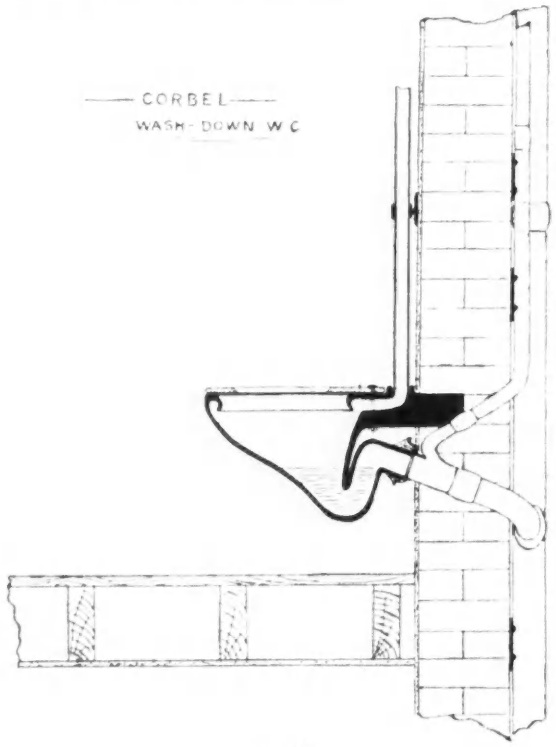


Fig. 10.

the wastes are arranged in the manner shown on the diagram. It always appears to me absurd to trap each basin separately and then connect them together again at the top.

Fig. 9 shows the method of dealing with the waste from "slop-hoppers" and "housemaid's sinks." I would first call your attention to the fact that a slop-hopper is quite an unnecessary fitting in a house possessing a water-closet on an upper floor. If, however, a slop-hopper is required, then it should be treated exactly as a wash-down type of water-closet, and under no circumstances should draw-off taps be placed over it.

The next fittings are the water-closets, the construction of which has enlisted the attention of sanitary reformers since 1775, when the first of this class of fitting seems to have been brought into use. In Fig. 10 we have a wash-down basin of the corbel or projector type, standing quite clear of the floor, and having the seat attached to the basin. The joint to soil-pipe is made with a brass socket and vent-arm in one piece, soldered to the lead pipes, and a cement joint made to the basin.

Lead, again, I consider the most suitable material for

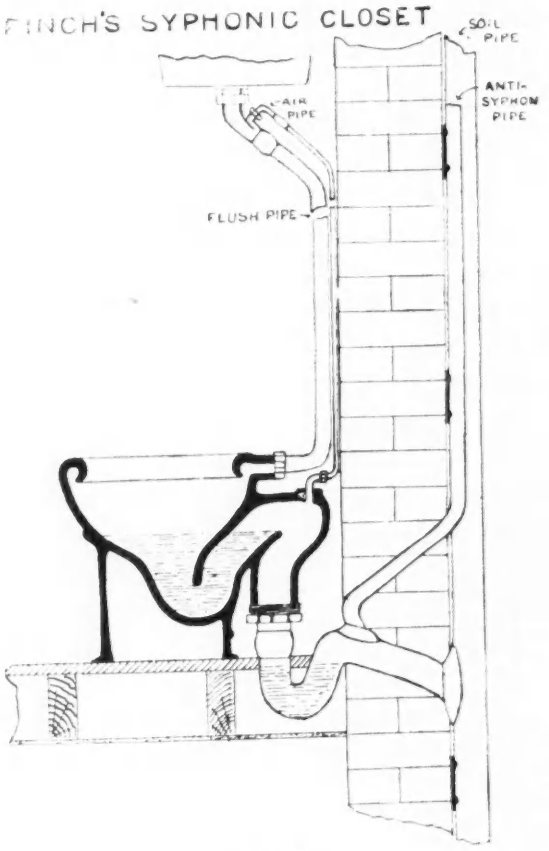


Fig. 11.

the soil and ventilating pipes, as, in addition to there being no action upon it, it offers the best means for making permanent connections to fittings and drains. The corbel closet is a good type for the inside of dwellings.

Fig. 11 shows one of the siphonic type of closets. This offers two water-seals against the entry of drain-air, and possesses an injector arrangement in the flush-pipe by which the siphonic action is obtained, and causes the contents of the basin to be driven out by atmospheric pressure; the flush-water being wholly utilized for cleansing and recharging the basin.

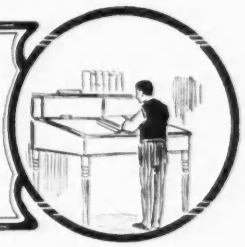
(To be continued.)

OBITUARY.

John Maurer of the plumbing firm of Maurer Bros. Co., Cleveland, O., died at his residence in that city on Friday, July 8th, after an operation for appendicitis, in his 39th year. He was a member of the Cleveland Master Plumbers' Association and of the Geyer lodge, Knights of Pythias. He is survived by his wife and three children.

BUSINESS MANAGEMENT

NEW METHODS FOR OLD



WINDOW DECORATIONS.

Editor "Domestic Engineering":—I am fixing over my shop and shall have a goodly amount of space in the front window for a display of goods, I thought that I would write you for a few pointers regarding this matter and will be greatly obliged for any hints that you may be kind enough to print in your very interesting "Business Management."

Helena, Mont. New Reader.

We have made it a point, for some time past, to publish attractive show-windows of various successful master plumbers and our friend "New Reader" can not do better than to keep his eye open for this line of practical information which educates without talking. Speaking for ourselves, were we to have the opportunity to decorate a show window for public view, we believe that we would aim at simplicity. We might not hit the mark the first time but we would try. We do not believe it a good plan to crowd all the lines the shop carries into the window at the first shot. Reserve something for the time when you must clean out the window and make an entire change in the effect. Do not allow the same arrangement to stand for a whole year. Think up a different set of combinations. With the wide variety of goods to select from there is no reason (other than laziness and lack of originality) for the plumber not have a new window-display at least once a month. Once a year would come nearer the mark for a large number who are in the business. We might suggest the idea of trying to suit the display at times to the season of the year. For instance, you would hardly display sprinkling attachments and hose in January, but might in June. Whatever you do, keep the windows and the display of fixtures in the window clean. Dust and cobwebs are out of date.

ON STOPPING NUISANCE-CREATORS.

Editor "Domestic Engineering":—From time to time I have observed so many excellent suggestions in your paper that I would like to ask for a pointer or two in the case following: In some toilet-rooms which are now under my care I am annoyed constantly by finding matches, cigar stubs and waste papers in the closets and urinals. These objects very frequently cause the fixtures to clog up and run over. What can I do to prevent such actions?

New York City. S. K.

In buildings that are open to the public this is a matter which it is hard to regulate. Constant attendance, observation and a "big stick" are about the only things that will have any effect, backed by an attendant who is able and willing to use these preventives. If the toilet-rooms are in a store or factory perhaps the putting up of placards forbidding the throwing of such matters into the closets and urinals would have some effect, especially if waste-paper baskets were provided and placed in a convenient location and in plain sight. We have observed many hotel toilet-rooms where no means were provided for the disposal of such matters and consequently they were thrown anywhere. Try it out.

WOMEN PLUMBERS?

Editor "Domestic Engineering":—I think that I saw some reference in your paper some time ago to women plumbers, or women master plumbers. Now I do wonder what branch of life and business they will get into next? Why if we had a crowd of women doing plumbing either as journeymen or masters the scale of wages and prices would go down with a thud. Look at the women clerks and stenographers and the wages they get. Do we want the like happening in our business? For my part I am strictly against the proposition.

Chicago. "J."

Our good friend seems to be somewhat "peeved" over the matter. If we recollect we merely said that there were some women plumbers and raised the question. Now why, if a woman can go into the business and make it pay, as some women have already done, why, we ask, should she not be welcomed to the business? It is well known that the average woman in any matter she undertakes is much more persistent and thorough than the average man. The chances are that if women did take up the business as a class, that we would soon have some very much more efficient and planer plumbing laws than we now have. Speaking to the mark, we men have been at the business now for forty or fifty years and not so very much has been accomplished along the lines of sanitary laws. We wonder just what the effect would be in the country, anyway, if there were say 5,000 women master plumbers in the United States?

A GOOD FOREMAN.

Every now and then we see an "ad" in the want columns for a man to take charge. We wonder how many of the masters stop to think of the qualities that this man should possess also how many of the boys can come up to the points mentioned. He should have:

1. An even temper. A crank or bully can soon upset the best of shops.
2. He should be able to size up the job as a unit. Not what one or two pipes will or will not do. How the job will act.
3. He should foresee the entire arrangement of material and work before the job is started.
4. If he is to estimate he must possess a common-sense education.
5. He should possess character enough to hold out for what is right and not truckle to his employer to hold his job.
6. No booze fighter can keep such a job for many days.
7. Age cuts no ice here. The man may be 30 or he may be 50. It's what he can accomplish that counts.

Ventilation in Its Relation to Health*

By William G. Snow.

I am to speak to you today on "Ventilation in its Relation to Health." The subject suggests a marshalling of figures and an array of facts, but I will not bore you with these. While it is admitted by all thinking people that ventilation must promote health, it is not realized to what extent the converse of this statement is true; that is to what extent ill-health is caused by insufficient or ineffective ventilation. When one considers how little time is spent out of doors by urban dwellers during our colder months, is it not of the utmost importance that their surroundings while indoors should be made healthful by plenty of sunlight and fresh air.

I will say at the outset that I shall have occasion to quote rather copiously from various authorities on ventilation and the quality of air and believe this is necessary in order to bring out clearly the data on which any conclusions are to be based.

In other words in discussing a subject like the one before us, we want not the opinion of one man alone but the conclusions of a number of persons who have studied the matter.

Therefore if the quotations to be given appear somewhat protracted, let the above remarks be borne in mind.

Taking up first:—

The Causes of Atmospheric Vitiation and Discomfort Within Occupied Inclosures.

The cause of which we most commonly hear is the accumulation of carbon dioxide (CO_2).

When we realize that this gas is increased over a hundredfold in the air passing through the lungs, it is not surprising that this component of the atmosphere accumulates rapidly in occupied rooms.

An interchange of gases takes place in the lungs, called the respiratory exchange, oxygen passing from the air to the body and carbon dioxide from the lung cells to the air about to be exhaled. The air discharged from the lungs is saturated with water-vapor.

In proportion to their weight, children give off about twice as much carbon dioxide as adults, hence the importance of adequate ventilation in rooms occupied by little ones.

Prof. Woodbridge of the Massachusetts Institute of Technology states that "The actual amount of air breathed may be averaged as 15 cu. ft. per hour, and that 0.6 cu. ft. of CO_2 is exhaled per hour by a person in repose; that the vapor elimination by a person at rest is about 1½ oz. per hour, about one-fourth of the vapor-elimination coming from the lungs."

He states that "about 1/67 of the body's weight of matter passes through the pores per day as **effluvia** or organic matter carried out through the pores with the perspiration. It gives a foul odor to crowded or poorly-ventilated rooms."

"The more active the perspiration the more free the effluvia-elimination."

"An assembly of 1,000 adults gives to the air each hour nearly 100 lb. of perspiration-vapor."

Woodbridge says further that "High humidity increases the amount of decomposable matter present in an occupied enclosure, it hastens its decomposition, it accelerates its diffusion and intensifies its putrifying odor."

As to the accumulation of carbon dioxide in occupied rooms to which atmospheric vitiation is commonly attributed, the late A. R. Wolff of New York, stated:—

"It is not the presence of the CO_2 itself which causes injury, but the bad company associated with its presence. The fact is that exhaled with the expired air besides the CO_2 are also organic matters and acqueous and other vapors and at the same time there are given off from the pores of the skin organic secretions and moisture, all of which taken together, and possibly acted upon and made more detrimental in effect by the heat of the room vitiate the atmosphere and jointly are the sources of the trouble. . . . . They go hand in hand with the amount of CO_2 in the room."

As to the degree of vitiation, the relative purity of the atmosphere is generally expressed in the number of parts by volume of carbonic-acid gas contained in 10,000 parts or volumes of air.

The proportion of this gas contained in the atmosphere may be easily determined by several methods, and it affords a fairly good index of the relative number of micro-organisms present and of the efficiency of ventilation.

In crowded rooms with the usual accompanying high temperatures the water-vapor from the lungs and the perspiration-vapor soon saturate the air and it is to this combination of temperature and humidity that some writers attribute most of the discomfort experienced.

That moisture is present in crowded rooms in cold weather is evidenced by the condensation on windows.

When it is considered that this moisture is chiefly from exhalations from the lungs and the elimination from the bodies of those present, it would seem evident that such a component of the atmosphere must not only produce discomfort but be positively harmful.

Macfie in his recently published work, "Air and Health," says:—

"Air containing merely the CO_2 and moisture usually contained in vitiated air will not produce the effect of vitiated air, and vitiated air therefore must contain an additional constituent. This additional constituent, though undetected by chemists, is probably detected by the nose for it is well known that air is oppressive and harmful not so much in proportion to the amount of CO_2 and moisture it contains as in proportion to its **smelliness**. The very fact that the nose is so sensitive to such odors would seem to suggest their harmfulness."

In addition to the carbonic-acid gas, the effluvia and the humidity mentioned, which affect the comfort and well-being of persons are the "dusts" to which Dr. T. Mitchell Trudden's little book, "Dust and Its Dangers," is devoted.

Outer air contains, of course, more or less dust which, when admitted to a building, tends to settle.

Dr. Prudden observes "that even **ordinarily efficient** systems of ventilation do not carry off any considerable proportion of the dust particles from closed still rooms . . . and that when by a system of **forced** ventilation we cause large volumes of dust-laden air from out-of-doors to pass through them we are actually so far as micro-organisms are concerned, cleansing the air and sending it out much freer from germs than when it entered, these having slowly settled as the air makes its way from the entrance to the exit of the ventilating openings." He says:—

"When we consider the comportment of dust-particles in closed rooms, we see at once that the great renovating and cleansing agencies which are so efficient out-of-doors

*A paper by William G. Snow, chief engineer, Warren Webster & Co., read at Cornell University, Ithaca, N. Y., May 24, 1910, in the course on Sanitary Science and Public Health, in co-operation with the New York State Department of Health.

are, except on special occasions, absent, namely, the winds and strong air currents and the more or less frequent and prolonged wettings. . . . A rainfall, to a certain extent, tends to free the air of its germs by washing them down. . . ."

Dr. Prudden points out that:—

"We should always remember that bacteria do not become detached from the surfaces or materials on which they grow or are lodged while these are in a moist condition. . . ."

He remarks "Ventilation is slowly becoming recognized as important, but the removal of dust, which in crowded places is very liable to be infectious, is not systematically attended to" . . . .

The most obvious means to prevent the accumulation of dust within enclosures is to remove it from the entering air.

We have briefly considered the cause of atmospheric vitiation, now as to the

Effect of Foul Air on Health and Comfort.

Billings observes that ("Ventilation and Heating") "It requires the observation of the effects on the health and life of a number of men exposed to such air for a series of months or years, to demonstrate the slow but certain production of throat and lung-troubles, the loss of energy and vitality, and the shortening of life which are thus produced. These observations have been made on soldiers occupying ill-ventilated barracks and operatives working in close workrooms, and comparison of these results has shown that where any room occupied by human beings there is a definite, unpleasant animal or musty odor, perceived by a person whose sense of smell is of the usual acuteness and who enters from the fresh outer air, the continued breathing of the air producing such odor will be injurious to health."

Mrs. E. R. Richards of the Massachusetts Institute of Technology, states in her book, "Air, Water, and Food," "That a permanent or habitual lowering of the oxygen in inspired air must be harmful will be readily seen from a consideration of the office of this gas in the body. (To Lavoisior and Paplaco we owe the knowledge that animal heat is derived from a process of combustion. . . .)

"By the union of the oxygen with the substances found in the tissues and brought to them by the circulation fluids of the body from digested food the heat necessary for the life and work of the body is produced. This heat is needed to keep the tissues at the temperature at which they can best accomplish their work, to give mechanical power for the involuntary action of heart and lungs for the process of assimilation, and to furnish the energy for all voluntary work and thought.

While the harmful effect of foul air may not be immediate further than its effect on one's comfort or mental acuteness, it is generally conceded that frequent and protracted exposure to such air, as in the case of poorly-ventilated school-buildings, results physiologically in a lowering of the vitality of the occupants, rendering them more susceptible to disease and considered economically results in a lessened efficiency on the part of both pupils and teachers.

Playfair asserts that, in modern hygiene, nothing is more conclusively shown than the fact that vitiated atmospheres are the most fruitful sources of disease."

Tuberculosis and pneumonia are most prevalent among persons living or working in unventilated rooms. Those diseases are caused by specific bacteria which for the most part gain access to the air passages by adhering to particles of dust which are inhaled.

As to the physiological effects of close air, Mrs. R. N. Richards in her book just referred to observes that "It seems to be indicated that the evil is due to the change in the respiratory quotient and to the consequent change in blood pressure, which interferes with the circulation. (The respiratory quotient is obtained by dividing the volume of carbon dioxide given off by that of the oxygen absorbed, and indicates how much of the oxygen has combined with carbon to form carbon dioxide, since one volume of oxygen combines with carbon to form one volume of carbon dioxide). The rate of exchange is influenced by questions of pressure, exposure, temperature, and water-vapor or moisture, muscular activity and the like."

Macfie in his work, "Air and Health," says:—

"Let us glance for a moment at the effect of the excess of carbon dioxide and the diminution of oxygen in vitiated air. Has this variation no vicious effect?

"Any one who compares his power of mental work in a pure and in a carbonic-acid-laden atmosphere, even if the latter be dry and cool, will find in the latter a considerable diminution.

"It may be contended that the human constitution becomes in time accustomed to vitiated air, and that much of the ill-health ascribed to bad air is really due to other circumstances, such as poor feeding and depressing surroundings, but the difference in health between country poor and city poor, and the improvement in health which always follows removal of impure air, is sufficient answer to such a contention."

Macfie further says, "Does such vitiated air as is ordinarily breathed in human habitations cause ill-health apart from the infectious germs or infectious material it may contain. . . . .

Air containing more than 8 parts by volume of CO_2 in 10,000 in occupied rooms appears close to one entering from out-of-doors.

It is, of course, almost universally believed now-a-days that in-door air rendered impure by respiration and combustion is harmful to health. To bad air we attribute much of the anaemia, the pallor, the neurasthenia, the general ill-health of slum-dwellers and factory workers and most persons engaged in sedentary indoor occupations."

As to the effect of dust, Dr. Prudden says:—

"Very moderate amounts of dust-particles in sensitive persons cause such a degree of irritation of the respiratory organs as either to deprive them of robust health or predispose them to the acquirement of various diseases which with unirritated lungs they would readily resist.

"As to the bacteria . . . there are unfortunately a few species which, when they once find lodgment in one place or another in the organs of respiration, may grow and multiply, and successfully resisting all the protective agencies of the body, set up distinct, persistent and even fatal disease. Those forms of bacteria which can or in those regions commonly do this, are insignificant in number in comparison with the harmless species with which dust is usually swarming. But few as they are they have an extreme significance. If it were not for these few species of disease-producing bacteria most people could perhaps afford to be as indifferent as they are to dust and its dangers. . . ."

It has been pointed out among the causes of atmospheric vitiation and discomfort that high temperature and humidity have much to do with the oppressiveness of the atmosphere in occupied spaces.

In this connection I wish to quote from a paper by Dr. Henry Mitchell Smith of Brooklyn, N. Y., read before the Brooklyn Medical Society. Dr. Smith says that:—

"Records of the temperature in a large number of houses showed . . . that it commonly ranged from 72 to 70 deg.,

and at times, in very cold weather, 78 deg. F. is recorded.

"Startling as are these figures in themselves and contrary to all accepted ideas of the proper conditions for living-rooms, yet a puzzling fact was that the sensations of the occupants were frequently not in accord with the readings of the thermometer. Rooms felt chilly when the recorded temperature indicated that they were far too hot. It was often hard to believe that the temperature was above 68 deg., when it was actually 72 and 74 deg.

"It was at once apparent that some unrecognized factor was responsible for this discrepancy between the temperature recorded by the thermometer and one's sensations. Moreover, it was found that the colder the weather the higher was the average temperature maintained in-doors. . . . The reason for this is the insufficient amount of moisture in our rooms in proportion to the temperature (low relative humidity). The colder the weather the lower will be the in-door relative humidity. . . .

"The point to be emphasized is that every time we step out of our houses during the winter season we pass from an atmosphere with a relative humidity of about 30 per cent into one with a relative humidity of an average of 70 per cent. Such a sharp and violent contrast must be productive of harm, particularly to the delicate mucous membranes of the upper-air passages. Watery vapor, what we term moisture, is as much a part of the air as is oxygen; absolutely dry air does not exist in nature. . . .

"The skin and the mucous membranes of the respiratory passages are the principal sufferers, since these tissues are always kept moist with their own secretions, and from them water is freely abstracted to satisfy this large saturation deficit. . . .

"A moment's consideration shows that the prevailing practice of depending upon the thermometer as the sole guide in the heating of buildings is not only inadequate and unscientific, but it is often misleading. It is not sufficient to know only the temperature if we desire either comfort or health for the same temperature produces varying sensations of warmth or cold, depending upon the relative humidity at the time existing.

"It is unscientific and arbitrary to lay down a fixed temperature as a standard for living or sleeping-rooms unless the relative humidity is indicated as well. . . .

"Records from steam-heated apartments showed that the relative humidity was sometimes as low as 25 per cent, with a temperature of 78 deg., during a period of very cold weather. . . . The high temperature is necessitated by the chilling of the body by the increased evaporation, evaporation being essentially a cooling process.

"It is needless to say how unhygienic as well as uncomfortable is such a distortion of the proper relationship between temperature and relative humidity. By regulating the in-door relative humidity we could keep our room temperature much more nearly stationary, irrespective of the temperature outside. . . .

"Thermostatic temperature-control will not fill the requirement, for a constant temperature is constant in its effect only if accompanied by a constant relative humidity. . . .

"Moreover, properly moistened in-door atmosphere lacks all the oppressive dry feeling so characteristic of the average artificially heated room. . . . The quieting effect of such an atmosphere is striking. . . .

"It was satisfactorily proven that one may live during the coldest weather with perfect comfort in a room at 65 deg. F. where the relative humidity is kept at about 60 per cent. During the experiments upon the sensations produced by different percentages of saturation and in order to obtain the opinion of persons having no knowledge of the existing conditions, one room was equipped with a moistening-apparatus and the temperature kept at 65 to 68 deg., with a relative humidity of about 60 per cent. An adjoining room, without a moistening-apparatus and heated by an ordinary steam-radiator, had an average temperature of 72 to 74 deg., with a relative humidity of 30 per cent. In every instance and without at all knowing what the temperatures were in the two rooms, the opinion was unhesitatingly expressed that the first room was several degrees warmer than the second.

"A moment's thought recalls the fact that we often sit out of doors with perfect comfort at a temperature that would cause us to shiver in our rooms in the winter. The relative humidity is the balance-wheel that regulates our comfort at different temperatures in still air. So repeatedly was this demonstrated that it may be accepted as a cardinal rule that if a room at 68 deg. is not warm enough for any healthy person, it is because the relative humidity is too low.

"It is inconceivable that with otherwise perfect means of heating, provision for producing sufficient moisture to maintain a higher relative humidity should have been so disregarded in all but these elaborate systems applicable only to large halls and public buildings.

Dr. Smith says:

"It is amusing to find that, in spite of the advantages of a moister atmosphere in-doors, objections have been raised against the use of devices for this purpose, on the ground that when the weather is very cold moisture condenses upon the window panes.

As to desirable and practicable relative humidities in rooms occupied in winter by persons in health, taking into consideration the cost of maintaining a high relative humidity in cold weather and the trouble from condensation on windows, I am inclined to favor a range from 40 to 50 per cent according to the weather rather than the higher relative humidity mentioned in Dr. Smith's paper, viz., 60 per cent.

As to the condensation on windows this will occur during cold weather when the in-door relative humidity is 40 per cent and even somewhat less.

When double-windows are used as is common in northern latitudes the condensation is much reduced.

(To be Continued)

THE EFFECT OF ILLUMINATING GAS ON VARIOUS OBJECTS.

In connection with an extended series of experiments upon the influence of sulphur in illuminating gas, Arthur D. Little, chemical expert and engineer, Boston, recently determined the extent to which moisture, containing sulphurous or sulphuric acids, condenses upon objects in a room in which gas is burned. Although delicate chemical methods were employed, no particular harmful results were shown, even when the ventilation of the room was greatly restricted with the resulting tendency for the humidity to increase. From this study it was evident that but little condensation of moisture would take place on the surfaces of articles in the room, and therefore but little harm could result, for it is a fact that if there was no precipitation of moisture containing the sulphur compounds, the sulphur gases that might exist in the air would have no corrosive effect upon any of these materials.

The results are of considerable interest in connection with the question of possible damage to metals, curtains, draperies, books or other articles that might be damaged by sulphur acids.

Sewage Disposal of the Community*

By Theodore Horton, Chief Engineer.

If the streams of the state of New York are to be protected against the discharge of raw sewage and other wastes into them, it is necessary that the municipalities and factories located along them resort to some means of natural or artificial treatment which will remove the objectionable or dangerous ingredients contained in them.

The selection of the most suitable means for accomplishing this end is, however, a matter which involves so many scientific considerations and depends upon so many local factors such as topography, character of soil and use of the stream into which discharge is to take place, that it is difficult to tell in advance of a careful study by a competent sanitary engineer what method or type of plant is most suitable in any particular case. Speaking generally, however, there are only a limited number of satisfactory types of sewage-disposal plants that are in common use at the present time, and whereas these have to be designed as to details and capacities to meet different local conditions, the essential features, or principles, upon which they are constructed and operated, are very similar and these will be briefly described.

The fundamental requirements of any system of sewage-purification may generally be considered to be the removal of the coarse and fine suspended matter, the oxidation or mineralization of the organic matter and in some cases a destruction of all bacterial life. The fulfillment of the first requirement is usually accomplished by some preliminary treatment such as coarse or fine screening and by settlement in tanks of suitable design and capacity. The second requirement is usually obtained by filtration or percolation of the sewage or effluent through filter beds of suitable material and design. While these treatments are usually accompanied by a large reduction in bacterial life, their complete removal (the third requirement) can usually only be accomplished by supplementary treatment of the sewage or effluent in fine-grained filters or by treatment in tanks with certain chemicals or disinfectants.

It will be seen at a glance that these three treatments may be considered as forming successive stages in the complete purification of the sewage: the first or preliminary treatment removing principally the suspended matters; the second, which may be considered the primary treatment, removing by oxidation the organic matter; and the third, or supplementary treatment, removing the bacteria and residual suspended matter.

It is not to be inferred that these three processes are to be successively employed in all cases where sewage purification is adopted, for it is not always necessary to completely purify the sewage, depending upon whether the object is merely the prevention of a nuisance or whether it is the protection of some water-supply taken from the stream at some point below the plant. Nor is it to be inferred that all three of these successive processes are required in order to rather completely purify the sewage. For instance, the direct application of raw sewage to sand filter-beds, as practiced in so many Massachusetts towns where sand of suitable quality is abundant, will in itself, when these beds are properly constructed and operated, produce an effluent which visually compares favorably with spring-water and in which the bacteria are so largely removed as to be generally safe for discharge into any stream.

Even when suitable sand is locally available, it is frequently found best to first remove the suspended matters by a short period of settlement, or to subject them to bacterial action in septic tanks, involving a longer period of settlement, before applying it to the sand beds. It is further occasionally found necessary to give the effluent from these filters a supplementary treatment by disinfection when the final discharge is into a stream relatively close to a water supply intake. In general, however, we may say that some one or two or all of these three fundamental processes will usually be employed in the treatment of nearly all classes of sewage or wastes, depending upon natural local features and the requirements of purification as determined by the conditions of the stream and the uses made of it below the sewage-disposal plant.

It will not be possible to take up in the brief space available any of the practical details of construction and operation of these different processes of purification, but an attempt will be made to describe them in a very general way. Let us assume that the sewage of the community has been collected in a sanitary system of sewers and has been delivered through an outfall-sewer to the sewage-disposal site and that it will be necessary to give the sewage a complete purification.

The first treatment which the sewage will receive will be its passage through a combined screening and grit-chamber. This chamber will be provided with one or more vertical or inclined removable screens, or possibly a rotating cylindrical screen, which will remove the grosser and some of the finer and lighter suspended matters. To further the removal of these suspended matters, especially of the heavier solids, this chamber will be constructed of such shape and dimensions as will give to the sewage a reduced velocity of flow and thus enable these heavier solids to settle out upon the bottom. This grit-chamber and the screens must be cleaned frequently and the sediment removed and properly disposed of.

The effluent from this grit-chamber will then be conducted to a settling or septic tank or possibly a chemical precipitation tank, where further opportunity will be given the sewage for settlement or septic action. These tanks are usually long and narrow and deep, and the dimensions are so proportioned that the sewage has an opportunity to pass through them very slowly and be retained in them for a period depending upon the object to be attained. If only a partial settlement is desired for the purpose of removing a moderate amount of suspended solids and thus partially protecting the filter-beds from silting up or clogging, the time of detention is limited to from four to six hours. If, however, a more complete removal of these solids is desired, thus more effectively protecting these filter-beds; or if a clearer effluent is desired to enable it to be discharged directly into the stream without further treatment, certain chemicals or coagulants are added before it enters the tank, which aid in the settlement or precipitation of the suspended matter of the sewage.

If again it is found expedient not to use chemicals and it is desired to remove more suspended matters than by plain settlement and at the same time to secure septic or bacterial action, the tanks are made somewhat longer and of greater capacity, thereby giving a longer period

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of detention, say from 8 to 12 or more hours. This septic action can only be secured through bacterial action and it takes a comparatively longer period than by plain settlement to permit the growth and development of these organisms. The effect of the septic-tank treatment then is to permit increased settlement of the heavier suspended matters and, through septic action, to subject the solid organic matter to the action of bacterial disintegration or digestion and transform it from a solid state into a soluble or liquid state. It is considered by many sanitary engineers that this so-called septic action which takes place only in the absence of air assists the later process of purification such as takes place in filter-beds, the action of which is largely dependent upon the presence of oxygen derived from the air.

From this settling or septic tank the effluent is then conducted to the filter-beds which are usually of sand or coarse-grained material. If suitable sand and sufficient area are available, sand-filters would probably be used. They would be laid out in beds of uniform size, usually within embankments, but occasionally between masonry walls provided with covers. The beds would be level, four to five feet deep and underdrained with tile-pipe. The sewage would be applied intermittently to the surface of the beds, in doses, and the purified effluent would be collected in the underdrainage system beneath.

If suitable sand, or sufficient area, were not available, contact beds or sprinkling filters would probably be resorted to. These filters consist of shallow masonry reservoirs or tanks filled with crushed stone or other coarse-grained material. With contact beds the sewage is applied intermittently in cycles of operation. That is, the bed is filled, the sewage allowed to stand in contact with the material for a definite period of a few hours, after which the purified effluent is drained from the bed through a system of underdrains laid beneath the filtering material. With the sprinkling filter the construction is similar except that the sewage is applied to the bed through nozzles in the form of spray—the sewage percolating through the bed and the purified effluent passing into the system of underdrains laid upon the bottom as in the case of the contact beds.

Just why and how this apparently simple treatment causes a transformation or purification of the organic matter of the sewage is a complicated question and one very difficult of brief explantion. Suffice it to say that when the organic matter is allowed to come intimately in contact with the right class of bacteria and in the presence of an ample supply of oxygen, they have the power to transform or oxidize it into stable and harmless mineral compounds. The object to be sought in biological filters is, then, to afford a harboring place for these bacteria and to supply air or oxygen under proper conditions and in sufficient quantities to permit of a complete oxidation of the organic matter.

The effluent from these biological filters will usually be sufficiently purified to be discharged into any water-course not used for drinking purposes. If, however, the stream is so used, the effluent would receive further treatment in tanks with disinfectants. The chemicals would be applied to the sewage before it flows into the tanks, in such quantities as would kill all bacteria which had survived the previous processes. The tank would be so dimensioned as to permit the liquid to remain in it for the period of time necessary for the chemical to disinfect or destroy all bacterial life.

The disinfection or sterilization-tank represents, then, the final stage in the complete purification of the sewage, and if each of the individual and successive processes has been properly designed and constructed, and the entire plant is efficiently operated, the final effluent will be a clear and sparkling water, free from suspended and organic matter, sterile, and, in general, suitable to be discharged into any stream without regard to the purpose for which it may be subsequently used.

What the Law Decides

PLUMBERS NOT ENTITLED TO MECHANIC'S LIEN GIVEN MACHINISTS.

A statue of the state of Washington provides that: "Every blacksmith, wagon-maker, machinist, or boiler-maker who has expended labor, skill, or material on any chattel * * * shall have a lien upon such chattel," etc. The supreme court of that state says that the case of Modern Plumbing & Heating Co. vs. American Soda Fountain Co., 106 Pacific Reporter, 628, was brought to foreclose a lien attempted to be perfected under the statute for labor and material furnished in connecting a soda-fountain, gas-drum, and generator with the city water-supply. The evidence showed that the plaintiff company was engaged in the plumbing business; that it furnished the materials for, and one of its employees made the connection stated and also packed some of the joints and cocks or valves of the soda-fountain. The whole work was done by an experienced plumber engaged in the plumbing business, and appeared to have been done directly in line with a plumber's work. There was no evidence that a machinist was employed to do the work, or that the work was necessarily that of a machinist.

At the close of the plaintiff's evidence the trial court was of the opinion that the work done was not that of a machinist within the provisions of the statute referred to, and therefore denied the lien and dismissed the action. The judgment of the trial court is affirmed. The statute in question applies to four classes of persons, namely, blacksmiths, wagon-makers, machinists and boiler-makers. It applies to none others. The plaintiff claimed that he was entitled to a lien because the work was done upon a machine; but the statue is not so broad as that. It provides that a machinist who has expended labor on any chattel shall have a lien thereon, and clearly intends to provide only for the classes named. To hold otherwise would be to say that the statute means that every person who performs labor upon a chattel shall have a lien thereon. Of course, the statute neither says nor means anything of that kind.

The statute means only that the classes named shall have liens for skilled labor performed on chattels. It does not mean that a painter may have a lien for painting an engine, or that a carpenter may have a lien for carpenter work done thereon, or that a plumber may have a lien for plumbing done on a machine. Blacksmiths, wagon-makers, machinists, and boiler-makers are distinct classes, well recognized, and do not include plumbers, painters, plasterers, and such like artisans. The plaintiff was therefore not entitled to a lien under the law simply because he worked upon a machine.

A contract for setting up and piping a boiler in the Lowell school, Boston, has been awarded to the F. W. Zemier Co with the approval of the mayor. The bids on this work were: F. W. Zemier Co., $3,000; J. J. Hurley & Co., $3,824; Laskey & McMurrer, $3,877; Huey Bros. Co., $4,127; J. P. Dwyer, $4,218; Smith, Alden & Co., $4,247; Lynch & Woodward, $4,767.

A Study in Centralizing the Heat Supply*

By J. D. Hoffman, Lafayette, Ind.

When your honorable president requested me to present a paper before your association upon some features of central-station heating, it occurred to me that the discussion of a few theories underlying a subject might be interesting. No doubt most of your members are more experienced than the writer, in the actual problems which come up for every day settlement in a plant of this kind, and it would be time wasted for me to attempt to enlighten you upon these things. On the other hand, since all persons enjoy spending a few minutes occasionally theorizing upon and discussing some of the more intangible things that are very frequently misunderstood, so today we may be able to have a mutual pleasure and I trust no little profit by spending a few minutes discussing where the many B. t. u. developed in a plant actually go and what effect they produce by the change.

In the natural growth of the heating business, one method replaces another and improvements on the old systems follow one another in such rapid succession that the up-to-date heating engineer must be continually studying conditions and methods in order to be ready and prepared for his work. Methods that a few years ago were considered satisfactory are now discarded as obsolete. The very rapid increase in the population of the country and the resulting concentration in cities and towns, have developed new conditions of living and new ideals of home life, and have created demands upon the general public that are startling. The average American citizen can take a retrospective glance over his own brief existence and can recall the time when the fireplace and the stove, as heating systems, were considered very satisfactory. These were the times when our fuel supply seemed inexhaustible and when the problem was not so much the saving of fuel as obtaining the assistance to burn it. The condition has changed and the watch word now is economy." Any system or any piece of apparatus that can justly claim increased economy of heating over some other system or piece of apparatus, other points being equal, is the one that is being demanded.

In addition to the question of economy we should also consider the question of convenience. Average furnaces, hot-water heaters and steam boilers for residences and isolated buildings require more or less care and attention for their satisfactory operation. In places where these buildings are closely situated to each other, and where it is possible—to reach them from some central point, it is fast becoming the habit to put in central-heating plants and connect them to these buildings by piping systems run in wood, brick, tile, or concrete conduits. In just the same way as the furnace centralizes all the rooms in one house and saves a number of smaller heating units, such as stoves, fireplaces, etc., so on a larger scale the centralized hot-water and steam plant unites buildings and eliminates the independent house plant. The responsibility and the personal attention required for operating these private plants are thereby transferred to those who are in constant attendance and who give personal supervision to this work at the central-heating plant.

The centralization of the heat supply for any district has an advantage over a number of smaller units in being able to burn the fuel more economically as well as being able to reduce labor costs. It has the advantage when in connection with any power plant, of saving a large amount of the heat that would otherwise go to waste in the exhaust steam and the stack gasses and turning it into the heating system. If it becomes merely a question of burning the coal in the boiler and turning this heat at once into the heating system, there would not be so much advantage in centralization, because the loss in the conduit would probably counteract other small advantages gained in the plant.

The price of coal would in such cases be the controlling factor, because a much cheaper grade of coal may be used in the large plant than in the smaller ones. The chief advantage in centralization at this time, however, is in the economy of the exhaust steam and the stack gases. In this connection the many electric lighting and pumping stations about the country give large opportunities for heating engineers to study the economics of heating. Since the average steam-power plant is very wasteful in these two particulars, any saving that could be brought about should certainly be sought for.

Conduit Losses: The principal objection that is being urged against centralization is that it necessitates transmitting the heating medium through a system of conduits, which in many cases is a wasteful process. Improvements are continually going on to perfect the conduit work and to protect from large heat losses, but as yet we have a large field for improvement before us. Concerning the losses from conduits no very satisfactory values may be given. Everything depends upon the quality of the materials and the workmanship in the installation. The materials used in the walls are wood, tile, brick and concrete; and all sorts of conditions may be found beween the pipe and the conduit wall. In some cases there are no insulating materials whatever between the bare pipe and the wall; in others, wood chips, hair felt, mineral wool, etc., are packed in loosely around the pipes, while in others, fibrous sectional coverings are applied to the pipes either in connection with or without the chips, felt and wool. Because of the wide variety of practice, it would not be worth the time spent to attempt to estimate heat losses upon a theoretical basis. The writer believes that the best grade of conduit and installation will be able to keep the radiation losses below 10 per cent, but that many installations will lose from 20 to 30 per cent of all the heat sent out from power plant.

Amount of Heat in Exhaust Steam Compared with the Amount in Saturated Steam at the Pressure of the Exhaust: To study the effect of exhaust steam upon heating problems and to determine, if possible, the theoretical amount of heat given off with the exhaust steam under various conditions of use, let us make several applications. First, to a simple high-speed non-condensing engine using saturated steam; second, to a compound corliss non-condensing engine using saturated steam; third, to first application when superheated steam is used instead of saturated steam; and fourth, to a horizontal reciprocating steam pump. Assume the following safe conditions: Case I. Boiler pressure 100 lb. gage; pressure at cylinder 97 lb. gage; quality of steam at cylinder 98 per cent; steam consumption 34 lbs. per indicated horsepower hour, one per cent loss in radiation from cylinders; and exhaust pressure 2 lb. gage. Case II. Boiler pressure 125 lb. gage, pressure at cylinder 122 lb. gage; quality of steam at cylinder 98 per cent; steam consumption 22 lb. per indicated horse-

*Read at the 2nd annual meeting of the National District Heating Association, held at Toledo, O., June 1-3, 1910.

power hour; 2 per cent loss in radiation from cylinders and receiver-pipe; and exhaust pressure 2 lb. gage. Case III. Same as case I with superheated steam at 150 deg. of superheat. Case IV. As stated later.

The number of B. t. u. exhausted with the steam in any case is, total heat in the steam at admission minus the heat radiated from the cylinder, minus the heat absorbed in actual work in the cylinder.

High Speed Engine:—Case I, (Application) let r = heat of the vaporization per lb. of steam at the stated pressure, X = quality of the steam at cut-off, q' = heat of the liquid in the steam per lb. of steam, and W = lb. of steam per indicated h.-p. hr. From this the total number of B. t. u., entering the cylinder per h.-p. hr. is

Initial B. t. u., = W(xr + q')

From Peabody's Steam tables r = 881, X = .98 and q' = 307; then if W = 34, Initial B. t. u., = 34 (.98 × 881 + 307) = 39792.92. Deducting the heat radiated from the cylinder we have 39792.92 × .99 = 39395 B. t. u., per h.-p. left to do work. The B. t. u., absorbed in mechanical work (useful work + friction) in the cylinder per h.-p. hr., is, (33000 × 60) ÷ 778 = 2545 B. t. u. Subtracting this work loss we have 39395 — 2545 = 36850 B. t. u., given up to the exhaust per h.-p. hr.

Comparing this value with the total heat in the same weight of saturated steam at 2 lb. gage we have 100 × 36850 ÷ (34×1152.8) = 94 per cent.

Compound Corliss Engine:—Case II, (Application.) With the same terms as above let r = 867.4, X = .98, q' = 324.4, and W = 22, then the initial B. t. u., = 22, (.98 × 867.4 + 324.4) = 25837.9. Less 2 per cent radiation losses = 25837.9 × .98 = 25321.14 B. t. u. The loss absorbed in doing mechanical work in the cylinder per h.-p. is, as before, 2545 B. t. u., Subtracting this we have 25321.14—2545 = 22776.14 B. t. u., given up to the exhaust per h.-p. hr. Comparing as before with saturated steam at 2 lb. gage, we have 110 × 22776.14 ÷ (22 × 1152.8) = 90 per cent.

Case III:—(Application.) Now suppose superheated steam be used in the first application, all other conditions being the same, the steam having 150 deg. of superheat, what difference will this make in the result? The total heat entering the cylinder now is the total heat of the saturated steam at the initial pressure plus the heat given to it in the superheater. This for one h.-p. of steam (34lbs.) if the specific heat of steam is .48, would be 34 × .99 × (1188 + .48 × 150) = 42411.6 B. t. u., and the heat turned into the exhaust will be 42411.6 — 2545 = 39866.6 B. t. u. Comparing this with the heat in saturated steam at 2 lb. gage = 100 × 39866.6 ÷ (34 × 1152.8) = 102 per cent.

Case IV:—(Application.) Pump exhausts are sometimes led into the main and used for heating purposes along with the exhaust steam from the engines. If such condition be found, what is the heating value of such steam? Assume the steam to enter the steam cylinder of the pump under the same pressure and quality as recorded for the high-speed engine. The steam is cut off at about 7/8 of the stroke and expands to the end of the stroke. With this small expansion the absolute pressure at the end of the stroke would be approximately 7/8 × 112 = 98 lbs., and if enough heat is absorbed from the cylinder wall to bring the steam up to saturation at the release pressure, we will have a total heat above 32 deg., in the exhaust steam per lb. of steam at 98 lb. absolute of 1185.6 B. t. u. Comparing this with one lb. of steam at 2 lbs. gage we have, 100 × 1185.6 ÷ 1152.8 = 103 per cent. Under the conditions such as here stated with a high release pressure, a small expansion of steam in the cylinder, and dry steam at the end of the stroke, it is possible to drop the pressure suddenly from pump release to a low pressure, say 2 lb. gage, and have all the steam brought to a state approaching superheat. It is not likely, however, that the steam is dry at the end of the stroke in any pump exhaust. The heat absorbed in radiation and in doing work in the slow-moving pump would be such as to have a considerable amount of entrained water with the steam, thus lowering the quality of the steam. These above conditions are extreme and are not obtained in practice.

From cases I and II it would appear that the greatest amount of heat that can be expected from engine exhausts, for use in heating systems, at or near the pressure of the atmosphere, is 90 to 94 per cent of that of saturated steam at the same pressure. The percentage will, in most cases, drop much below this value. All things considered, exhaust steam having 80 per cent of the value of saturated steam at the same pressure is probably the safest rating when calculating the amount of radiation to be supplied by the engines. In many cases, no doubt, this could be exceeded, but it is always best to take a safe value. On the other hand, when figuring the amount of condenser, tube surface or reheater tube surface, to condense the steam, it would be best to take exhaust steam at 100 per cent quality since this would be working toward the side of safety.

In plants where the exhaust steam is used for heating purposes and where the amount supplied by direct-acting steam-pumps is large compared with that supplied by the power units, it is possible to have the quality of the exhaust steam fairly high. This condition is sometimes met with in practice, and may be the explanation of the statement sometimes heard, that exhaust steam gives better service for heating purposes than saturated steam at the same pressure. It should be understood that saturated steam at any stated pressure always has the same number of B. t. u. in it no matter whether it is taken directly from the boiler, or from the engine exhaust. A lb. of the mixture of steam and entrained water, taken from engine exhausts, should not be considered as a lb. of steam. If we are speaking of a lb. of exhaust steam without the entrained water as compared with a lb. of saturated steam at the same pressure, they are the same, but a lb. of engine exhaust or mixture is a different thing. In cases where engine and pump exhausts are mixed, the available heat per lb. of steam will be somewhere between 800 and 1000 B. t. u. As suggested above, however, a safe value for general work is the lower figure.

(To be continued.)

The Warren Webster Modulation heating-system in the Haynes office building, Boston, showed a consumption of only one pound of coal per hour for 70 sq. ft. of heating surface during the period from December 1 to May 15, the average outside temperature for the entire time being 36 deg. This result was due to the fact that there is never any overheating with this system and the consequent waste of steam.

While there is some new building going on in the Pittsburgh district and the plumbers are fairly busy, no large contracts are being let that will compare in magnitude to that for the new Henry W. Oliver office building.

There is a merry war in progress among the plumbing inspectors of Attleboro, Mass., the board of health on July 1 having named two new inspectors, J. M. Seagraves and Arthur B. Read, to act with Inspector Henry H. Wilcox, and having placed Wilcox on a fee basis instead of paying him a regular salary as in the past. The result is there is much rivalry between the three inspectors as to who shall get the inspection jobs, and the consequent $2-fee, as each come up.

VENTILATION OF CHEMICAL HOODS.

By Chas. L. Hubbard.

The ventilation of chemical hoods in our modern school buildings is a matter of some considerable importance, and it seems that a few simple points in connection with this subject might be of interest to the readers of this magazine.

In order for a ventilating flue of any kind to "draw," there must be some means provided for producing a suction. Simply connecting the hoods with an open flue will not have the desired result unless some special means are provided for producing a draft. This may be done either by heating the flue, or mechanically by means of a fan. Fig. 1 shows a simple method of producing a draft in a single hood. This may also be used with fairly good results in small laboratories, where there are only a few hoods to care for. Flue-heaters of the usual type cannot well be used on account of the corrosive effect of the fumes. For this same reason they cannot well be turned into a flue surrounding an iron smoke-stack. While the surface of the heater or stack may be covered with a protective paint, this will in time become defective and cannot well be renewed without considerable expense. The most effective method of ventilation in laboratories of any considerable size is by the use of a fan. This is effective under all conditions of outside temperature and the fan and casing may be easily reached for painting as may be required.

Sometimes the fan construction is of copper or bronze to lessen corrosion. Fig. 2 shows a series of hoods ventilated by a steel-plate exhauster driven by a direct connected electric-motor. Chemical laboratories are usually located upon the upper floor of a school-building so that the exhaust-fan and connecting ducts are easily placed in the attic above, as shown in Fig. 2. The uptakes may be concealed by closing in the space above the hoods if so desired. Glazed-tile piping makes a good material for connecting the hoods with the fan.

Fig. 3 shows a disk-fan arranged for hood-ventilation. Belted fans are generally used for this purpose with the pulley brought outside the casing as shown in the cut. It would, of course, be out of the question to use a direct-connected motor attached to the fan in the usual manner, as it would be necessary to pass the fumes from the hoods directly over it. Means may be provided, if desired, for supporting the motor outside the casing and attaching to the elongated shaft of the fan by means of a flexible coupling.

Fig. 4 shows a section through a hood of special construction which has given very good results in practice. These hoods are built in groups or sections in which B is a chamber common to all of the hoods in the group. This chamber is connected, preferably at the center, with an exhaust-fan.

The various hoods connect with chamber B through slots about two inches in width near the front. The upper part of the hoods (see space A) slopes toward the front to the slot, already mentioned. The object of this construction is to restrict the outlet, so as to produce a comparatively high velocity at this point for a given volume of air-flow through the hood. The front of each hood is closed in by a sliding sash. A stop is provided as shown so there will always be an opening at the bottom for the admission of air to produce a circulation. The path of the air through the hood is indicated by the arrows. Air enters beneath the sash and passes upward; it is then deflected by the sloping top toward the front where it is caught by the strong draft through the slot and carried into the chamber B. The volume of air

TABLE I.

Table I gives approximate data for small exhausters with cast-iron casings such as are commonly used for forge-work. This type of fan is well adapted to this class of work as the casings being of cast-iron are not easily corroded and the fan may be of copper if desired.

	½-Ounce Pressure.			1-Ounce Pressure.		
Dia. of Fan Wheels in In.	Rev. per Min.	Cu. ft. of Air Discharged per Min.	Horse-Power of Motor.	Rev. per Min.	Cu. ft. of Air Discharged per Min.	Horse-Power of Motor.
8	1,700	80	.04	2,400	120	.10
10	1,400	160	.07	2,000	230	.20
11	1,250	230	.10	1,800	330	.30
12	1,150	340	.14	1,600	480	.40
15	950	480	.20	1,350	680	.56
18	800	670	.28	1,150	950	.67
20	700	840	.35	1,000	1,200	1.00
23	600	1,500	.60	850	2,100	1.7
27	500	2,100	.90	750	3,000	2.5
31	450	2,900	1.20	650	4,000	3.4

TABLE II.

Table II gives data for disk-fans to be used under the same conditions.

Dia. of Fan Wheels in In.	Rev. per Min.	Cu. ft. of Air Discharged per Min.	Horse-Power of Motor.	Rev. per Min.	Cu. ft. of Air Discharged per Min.	Horse-Power of Motor.
18	700	1,400	.10	800	1,700	.20
21	600	1,900	.15	760	2,400	.28
24	520	2,500	.20	660	3,100	.36
30	420	3,800	.30	530	4,900	.56
36	350	5,600	.42	440	7,000	.80
42	300	7,700	.60	380	9,600	1.10

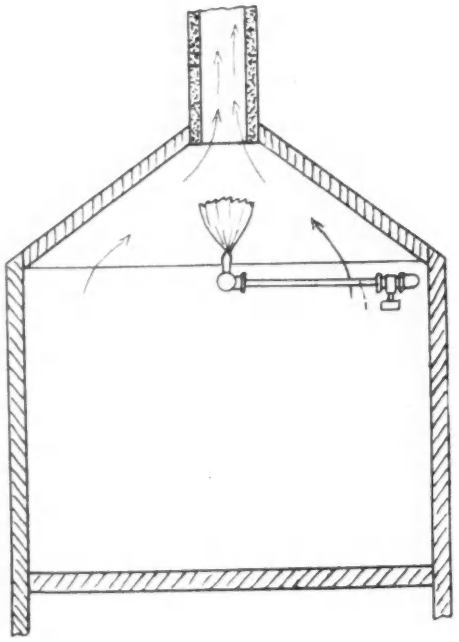

Fig. 1.

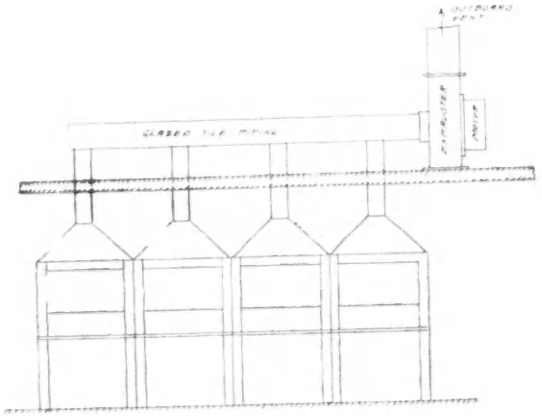

Fig. 2.

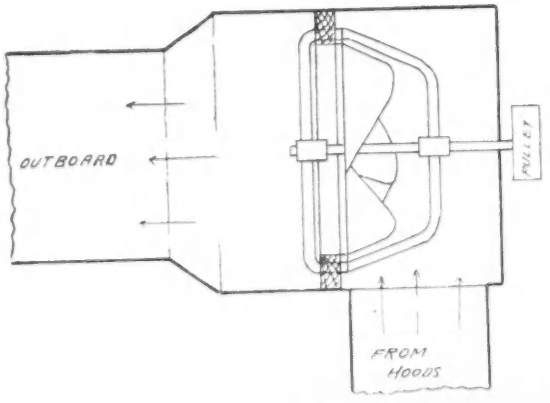

Fig. 3.

drawn through a hood should be sufficient to produce a constant draft through the front opening of such strength as to prevent any liability of back-drafts into the room. In the case of a gas-jet as in Fig. 1, no definite air-flow through the hood can be counted upon, but with a fan this can be made practically anything that may be desired. If a hood is 2 ft. wide, and it is desired to pro-

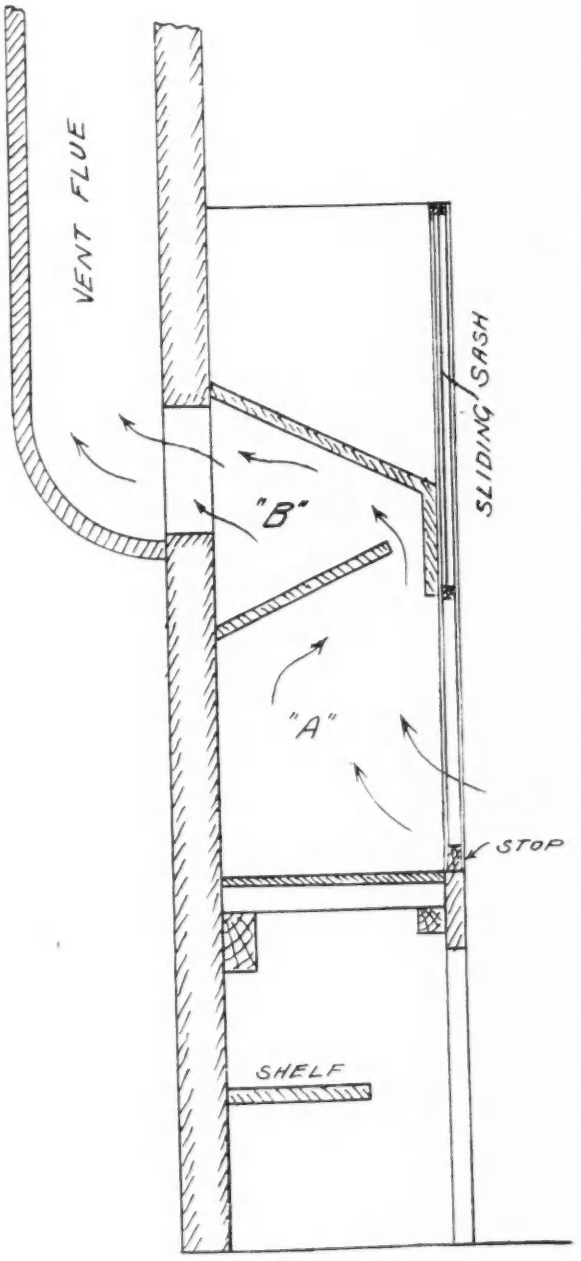

Fig. 4.

duce an inward flow of 100 ft. per minute, when the sash is raised 1 ft. it will require 200 cu. ft. per minute per hood, and if the slot into chamber B is 2 in. in width, this volume of air will pass through with a velocity of 600 ft. per minute, which is sufficient to prevent the fumes from passing by it.

THE DEVELOPMENT OF SANITATION.

By Warfield Webb.

We hear a great deal about modern sanitation these days, and the suggestions that are sometimes offered for its betterment. Perhaps the most palpable cause for any lack of intelligent action in this respect by the majority of people is from a want of care, although ignorance is sometimes the base of the evil. We have now reached an age in which there has been a revision in our methods of construction work, and in the manner of our living. There is more attention being given to causes than to effects, and in order to remove an evil we are seeking to remedy the cause.

Much of this has been brought about by actual necessity. Our cities are growing in size, and this increased congestion demands that the health of the individual be given greater concern, which for the greater part depends upon the sanitary condition of our living and business structures, as well as upon the manner in which we eat and conduct ourselves. However, there is still ample reason for a further innovation in this respect, and to this end every thinking man must lend his aid.

The proper disposal of sewage, in whatever form, is coming in for a more careful consideration, and there have been results obtained in this respect that are proving the value of the work thus far accomplished. It is true that there are still some grave errors being permitted, but these cannot be regulated without long periods of labor, in which many are the sufferers. Our health bureaus and boards that have as their sole aim the improvement of conditions looking toward the public welfare in this respect, are doing much to alleviate the distressing conditions, and the results are seen on every side.

We now endeavor to prevent disease by removing the possibilities, rather than the cause, and to this end there must be intelligent co-operation on the part of all. It is far easier to prevent the spread of an epidemic before it has gained headway, than to do so after it has taken root in the community.

In the construction of our modern buildings, particularly as applied to apartment-buildings, there have been, and the error is still noticeable, some installations that cannot insure for us greater health. The construction of apartments should be considered as much from their sanitary standpoint as for convenience and space-saving. The planning of the structure should be carefully conceived, and the matter of the bath-room given more consideration than any other portion of the building. This is self-evident, because its location may mean the greater health and comfort of the occupants, and from a sanitary standpoint it has much to do with our health.

We find in some structures that the bath-room is constructed so that it opens directly into our sleeping apartments. That this is an error, and one that should not be permitted by law, is reasonable. Further than this, the bath-room, on account of its very existence and purposes, is too often poorly ventilated and is hidden away in some out-of-the-way place, where there is either poor ventilation or very little. How often is it located so that the windows are simply openings into a court? There is small opportunity for any amount of fresh air to enter the apartment, and it is safe to assert that the health of the occupants is not improved by these conditions.

Then the matter of common neglect, either through carelessness or ignorance, is a cause for greater alarm. The closet-bowl is sometimes the receptacle for all kinds of filth, and is used as a garbage-chute. The consequence is that the plumber is called upon to remove the obstruction, and is not infrequently blamed for a poor class of work, when the cause is directly due to careless and ignorant tenants.

The sink is not infrequently the cause for similar complaint, and there should be rules to govern these receptacles that would assist in making the damage to property and to plumbing less costly, while being more conducive to our health. The cause for much of this damage is readily traceable to such actions, and there is ample reason for a reform that will be profitable to many house-owners.

It is pleasing to find that there have been made some notable improvements toward more sanitary conditions, and there is no doubt but that there is still room for further improvements in this way. It is an undertaking that means the education of the public, and in compelling them to understand the simple truth that when they fail to take the proper precaution against disease there will be little possibility of escape. This demands the attention of every individual, and particularly those who have in charge the construction of buildings and the carrying out of the labors that are so essential to our greater health in preventing the spread of germs that will menace our physical welfare.

THE RATE OF CHANGE OF AIR IN A CLOSED ROOM.

From time to time experiments have been made to determine the porosity of walls and the leakage of air around windows and doors as affecting the ventilation. Recent experiments conducted by Arthur D. Little, chemical expert and engineer, Boston, have incidentally shown in an interesting manner the rate of change of air in a closed room. This room, having a contents of 615 cu. ft. was located in the second story of an ordinary frame dwelling-house with clapboarded exterior walls. The interior walls and ceilings were plastered and papered, the single window was made as tight as possible by means of putty, and the interior door was fitted with weather strips. Notwithstanding these conditions, which one might assume would very materially limit the rate of ventilation, it was found that through perfectly natural causes the air was changing at the rate of 1 8-10 times per hour. This fact was shown accurately by measurement of the rate of disappearance of carbonic acid.

TRADE LITERATURE.

The Jefferson Union Co., Lexington, Mass., has recently prepared a catalog on their style F male and female union. This is ready for distribution and will be sent on request. The company is also preparing a catalog on its new swing union which is almost a "universal union." This booklet will be ready for distribution in the very near future.

A new catalogue descriptive of their improved Aertube heater has just been published by the Harrison Engineering Co., New York City. It will be mailed on request to persons interested in heating installations.

Price-list No. 10 is now being distributed to the trade by the Kellogg-Mackay Co., Chicago. This list is arranged in pocket form and contains illustrations, lists, sizes, dimensions and capacities of the company's steel and cast-iron boilers, tank and laundry heaters, radiators, valves, heat economizer, vacuum system, pipe, fittings, traps; in fact, everything required for a complete heating and ventilating system. The book has an index which is convenient for ascertaining exact location of the various articles listed, and the general arrangement such as to render it of much aid to fitters and architects in figuring or designing work of this character. The concern will be glad to send copies to readers of "Domestic Engineering."

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NOTICE TO ADVERTISERS.

Copy and cuts for advertisements intended for a particular issue should reach the office of Domestic Engineering on Monday of the previous week if it is desired that a proof of the advertisement shall be submitted. New advertisements can be received up to noon of Monday of the week of issue, but no proof can be shown.

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SPECIAL NOTICE TO READERS.

Our readers are invited to send in articles on any topics covering sanitary interests as outlined above. Photographs and drawings with descriptions of special interest to plumbers and steam-fitters are welcomed. "Domestic Engineering" pays at space rates for all articles, notes, criticisms and news data so contributed.

Among the Wholesalers

WILL ERECT LARGE PLANT AT RICHMOND, CAL.

The Western Pipe & Steel Co., which makes a specialty of pipe for oil wells and distributing systems, is planning to erect a large plant at Richmond, Cal.

CRANE CO. TO BUILD AT TACOMA, WASH.

Contracts are to be let shortly for the construction of the new building for Crane Co. at Tacoma, Wash. The manager of this branch is now in Chicago and upon his return it is expected that work on the new $50,000 structure will be commenced.

WORK ON NEW VOLLRATH PLANT STARTED.

Excavating for the foundation of the foundry building, the first building to be erected at the new plant of the J. J. Vollrath Manufacturing Co., Sheboygan, Wis., has been commenced. Building material is being received in large quantities and every effort will be made to complete the part of the plant which has been planned for this year.

At the Chicago Convention of the National Association of Master Plumbers. From Left to Right They Are: Albert E. Pollock, Sales-Manager; H. C. Macaire and L. Morris, Sales Representatives; All of the Peerless Heater Co., Chicago.

RENO-RATE CASE INTERESTS JOBBERS.

Jobbers of plumbing and heating supplies at San Francisco are watching to see what will be the effects of the decision recently rendered in the so-called "Reno-Rate Case." By this decision Reno, Nev., and other inland cities will be given a lower freight rate and the opinion is that a small jobbing business may be set up there and in other places taking a limited amount of territory from the regular distributing centers. Los Angeles jobbers have been trying to get their already low rate into the San Joaquin Valley made still lower in order to annex more territory but a decision has been rendered against them.

BISHOP & BABCOCK CO.'S CHICAGO BRANCH ENLARGED.

If you happen to notice workmen enlarging a church, you can make up your mind that there is either a popular preacher presiding over it, or that the committee on entertainment has been working over-time. At 192-194 East Washington St., Chicago, you will find another scene of activity. The Bishop & Babcock Company has leased the adjoining building and has added 11,000 square feet of floor space to its already large quarters. It is not a case

of preaching or of entertainment, but a result of popular demand. It is a matter of their old place being too small to accommodate the rapidly growing business. This enlarged space will be utilized for the display of "Reliable" vacuum pumps for heating systems, gasoline storage tanks for private and public garages, hydraulic air-compressors, and electric and hydraulic water-lifts.

BUILDING ADDITION TO ITS PLANT.

The Acme Heater Co., Toledo, O., is building an addition to its plant in that city.

AYLING & REICHERT BUILD NEW PLANT.

Ayling & Reichert, Toledo, O., have under construction a new plant which will quadruple their capacity.

CLIMAX SPECIALTY CO. BUILDS PLANT AT ANN ARBOR.

The Climax Specialty Co., formerly of Seneca Falls, N. Y., has moved to Ann Arbor, Mich., where it is building a modernly equipped plant which will add largely to its capacity.

CHARLES S. STEPHENS ON BUSINESS WAR-PATH

Chas. S. Stephens, 5 Beekman St., New York City, former eastern representative of the Wheeling Steel & Iron Co., Wheeling, W. Va., visited the office of "Domestic Engineering" in Chicago recently. Mr. Stephens was also eastern sales-manager of the Riverside Iron Works for a number of years and up to the time of its absorption by the National Tube Co. After a most successful service with the Wheeling Steel & Iron Co. he severed his connection on July 1st with that company, with the idea of finding a larger field of opportunity for salesmanship. He is at the present time renewing his many acquaintanceships, and though he has not yet allied himself with any other firm or company, he expects, during the next six months, to be connected again with some firm catering to the needs of the plumbing, heating and gasfitting trades. Mr. Stephens has a vigorous personality and is regarded as being one of the most successful salesmen in the United States. He has achieved an enviable record in his previous positions as manager of sales-territories, and his friends wish him good fortune in any new enterprise to which he devotes his business energy.

PERSONAL MENTION.

John R. Steneck, sales-manager of the Illinois Malleable Iron Co., Chicago, has the sympathy of a large circle of friends on account of the death of his son John Randolph, which occurred at his residence in Oak Park, Ill., on Saturday, July 16. He was 12 years old and a very bright and promising lad.

Carl Vollrath, vice-president of the Porcelain Enameling Association of America and a member of the J. J. Vollrath Manufacturing Co., Sheboygan, Wis., together with his wife and two guests, narrowly escaped death recently when his automobile, in which they were riding, caught fire and was destroyed.

Robert Bartingale, a member of the Grosvold-Bartingale Plumbing Co., Eau Claire, Wis., received a bad scalp wound and other serious injuries in a runaway accident in that city last week. He was rendered unconscious by the accident and it took a doctor some time to revive him. He is now reported to be on the road to recovery.

M. G. Pierson, well known to the heating trade through his many years' connection with the United States Heater Co., has resigned to become associated with the Kelsey Wheel Co, Detroit.

A. H. Ross, formerly with the United States Heater Co., Detroit, Mich., has accepted the position as manager of the United States Radiator Corporation's branch at Detroit.

O. P. Benjamin, who has a large acquaintance among the trade through his many years' connection with the Detroit Brass Works, Detroit, Mich., has been made vice-president of the Detroit Valve & Fittings Co., Wyandotte, Mich. Mr. Benjamin will continue to be associated with the Detroit Brass Works.

A BENEFICIAL OCTOPUS.

The Kellys not only claim their descent from the first king of Ireland, but have undertaken the task of proving that an octopus can have pleasant, instead of formidable, associations and can be of beneficial use. Thos. Kelly & Bros., 422 45th Court, Chicago, have recently issued a catalog, part of which is devoted to the demonstration by effective description and illustration that the Kelly octopus is a good thing. The octopus fitting is a one-piece casting, and when set in place, completes the roughing-in for eight water-closets, the total combination occupying a circular floor-space, only 7 feet 6 inches in extreme diameter.

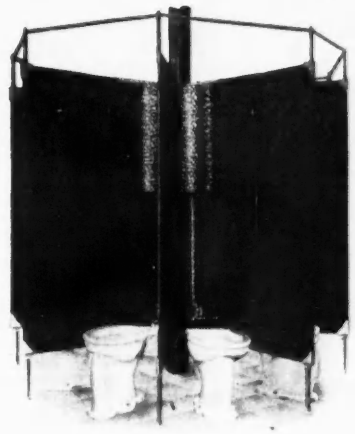
The closet-bowls, with suitable gaskets, are bolted direct

The Kelly Octopus Fitting.

to the heavy iron flanges which make a solid and durable joint and foundation.

A point of merit of the Kelly system is that it does not require back-traps or a separate ventilating pipe for each individual closet as is common in old methods. This disadvantage of the old types was due to the fact that closets were not set within 5 to 20 feet from the ventilation-pipe, thus leaving long stretches of pipe to be supplied with air.

All the legs, railings, and other fittings required for fastening the partitions are of brass. The partitions are



The Kelly Octopus Water-Closet Combination.

furnished in heavy galvanized steel, plain oak, marble, slate or any kind of wood desired.

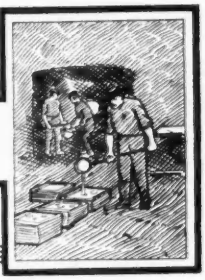
Canvas curtains to slide on overhead railings are also procurable. If the octopus fitting is wanted with revents, these can be secured upon application.

The Kelly products are noted for their durability. The ordinary "puss" is credited with nine lives so, according to Kelly mathematics, the "Octo-puss" has 72 lives, and is therefore the most durable fitting in the market.

Many other things are shown in this new catalog, every one of which were invented by the Kellys who were also the originators of the compressed tanks, used for flushing water-closets. Numerous types of closet-combinations are shown, and plumbers can secure a complete review of these by writing to Thos. Kelly & Bros.

Knight Bros., Westbrook, Me., have a contract to do considerable plumbing and other work in the Frederic K. Robie school at Gorham, Me.

THE METAL MARKET



LOWER PRICES FOR PIG IRON.

New low records have been made in the price of pig iron during the week and it seems that in spite of repeated announcements that the bottom has been reached prices may be still further reduced. Practically the only buying is from foundries which need iron for immediate requirements and others who wish to buy iron at this time to average the cost of that purchased some months ago. It may be stated, though, that the stock iron consumers have on hand is not large. Some buying has developed from pipe founders who are anxious to secure low-priced material. Machinery manufacturers have purchased scattered lots and the cast-iron pipe makers have also been in the market. A significant criticism was recently made that were the capacity of the blast furnaces of this country no greater than in 1907 there would be a veritable famine in spite of the extremely limited demand as it is now viewed. In other words, although the consumption of the country is now greater, in a dull year, than in a previous boom year, the facilities for manufacturing have increased so that there is an unwieldy surplus. Prices are as follows:

No. 2 Southern foundry, Birmingham	$11.50 to $12.00
No. 1 Virginia foundry, New York	16.50 to 17.00
No. 2X Northern foundry, New York	16.25 to 16.50
No. 2 Plain Northern foundry, New York	15.75 to 16.25
No. 2 Northern foundry, Chicago	16.50 to 17.00

AN IMPROVED DEMAND FOR LEAD.

The demand for spot lead is slightly better, outside sellers having all the business they can take care of. It would not be surprising if their quotations should be again advanced and made slightly higher than that of the American Smelting & Refining Company, which is 4.40 cents.

TIN SLIGHTLY EASIER.

Considerable business has been transacted in the tin market and consumers have been able to purchase tin in New York at less than import cost. Some of the smaller sellers have been anxious to place contracts for forward shipment and dealers in New York have purchased these contracts, selling spot tin against them. This is an unusual thing to do in the tin market, but once before this year it was done, then with a profit to the seller. The price of tin is lower, being obtainable, in five-ton lots, at 32.40 cents.

LITTLE BUYING OF COPPER.

Consumers of copper are reluctant to enter the market to buy, for prices have receded so gradually that it is difficult to determine whether the bottom has been actually reached or not. Then too, the leading selling interest in this country is asking 12.50 cents for prompt shipment while much metal has been sold for July delivery at lower figures. Two interests—the Guggenheims and their followers and the Amalgamated people with the Cole-Ryan Syndicate are contesting for supremacy in the market. The Guggenheim interests are selling copper as rapidly as possible, having already sold much metal for September delivery, and are willing to dispose of supplies for later in the year. The Amalgamated interest on the other hand adhere to the belief that they hold the balance of power and consumers must come to them for at least a portion of their supplies. What the outcome will be is hard to conjecture. It is at least significant to note that these price concessions are stimulating consumption and melters are now using more metal than ever before. They are unwilling, however, to make contracts for future delivery except when favorable quotations can be secured.

OLD IRON.

The supply of old material is exceptionally large and rolling mills are refusing to buy except at bargin prices. Quotations are more or less nominal as follows:

No. 1 yard wrought long	$11.50 to $12.00
No. 1 yard wrought short	11.00 to 11.50
Machinery cast	12.00 to 12.50
Wrought pipes and tubes	11.75 to 12.25
Wrought turnings	6.75 to 7.25
Cast borings	6.50 to 7.00
Stove plate	9.00 to 9.50

CONTRACTS AWARDED.

The John O'Brien Boiler Co., St. Louis, Mo., has been awarded the contract for the installation of a new heating plant at State Hospital No. 1 at Fulton, Mo. The consideration is $26,150.

P. A. Magirl, Bloomington, Ill., has secured the contract for repairing the plumbing systems in the Washington, Lafayette and Jefferson schools at Kankakee, Ill. The contract amounts to $1,040.

The West End Heating and Engineering Co., Philadelphia, Pa., has been awarded the contract for the installation of a central-heating plant at Mont Alto Sanatorium. Consideration $77,523.

William Leonard, Colorado Springs, Colo., has secured the contract for the installation of a plumbing system in the residence of S. J. Davis on Washington avenue.

The Roekel Plumbing & Electrical Co., Zanesville, O., has secured the contract for the plumbing and heating of the Munson school building. Consideration, $5,017.

The Moline Heating and Construction Co., Moline, Ill., has been awarded the contract for the installation of a new heating plant at the Irving school in Davenport, Ia. The contract amounts to $9,400.

J. G. Hoffman, Texarkana, Ark., has been awarded a contract for the plumbing and steam-heating of two high school buildings at Dequeen, Ark. The consideration is $2,992.

The Salem Hardware Co., Salem, O., has been awarded the contract for the plumbing, heating and ventilating of the new M. E. church in that city.

The McNichol Plumbing & Heating Co., Oshkosh, Wis., has been awarded the contract for the installation of a central-heating plant at the St. Mary's church and school at Neenah, Wis.

The Samuel A. Esswein Heating & Plumbing Co., Columbus, O., has been awarded the contract for the boilers and piping at the State hospital. Architect F. L. Packard prepared the plans.

Moffett & Riva, Berlin, N. H., have a number of important contracts in hand, one of them the plumbing and heating of St. Regis academy, being the largest ever given out in the county. They also have the contract for plumbing and heating a new garage which is being erected on Exchange street and for plumbing and heating Dr. F. H. Vallendar's new residence.

The palatial country residence of Capt. J. R. DeLamar, at Glen Cove, L. I., to cost $275,000, now being designed by C. P. H. Gilbert, architect, New York City, is to be heated and ventilated by the Harrison Aertube heater system to be installed by the Harrison Engineering Co., New York City, which has the contract for the entire plant.

PACIFIC COAST LETTER

The various delegates of the Master Plumbers' Association of California who made the trip to Chicago to attend the national convention have returned and the ideas secured there will soon be taken up and discussed at meetings of the various locals. Frank J. Klimm, president of the Master Plumbers' Association of San Francisco lengthened his stay to look into the general sanitary conditions of the schools in some of the large Eastern cities and comes home with some new ideas. As far as plumbing, heating, and mechanical arrangements are concerned, Mr. Klimm is of the opinion that our new schools are the equal of any in the East, but he urges that better medical care be furnished the scholars. In New York he found that for every two schools there was a physician and in Chicago there was a physician for each school. This care, he believes, is necessary to supplement the work properly along sanitary lines that has been brought to such a high state of perfection and he will urge that better provisions be made for the care of school children here.

From Stockton word has been received that work is to be resumed by the various building trades this week and that agreements were being made that would soon put an end to the labor trouble that has been making its effects felt there for some time. While the plumbers there have not had any special grievances they have been out of work since the sheet metal workers declared their strike and operations there have been at a standstill generally. At Los Angeles the strike of the metal trades is still on and operations are being hindered to some degree but building operations are far from being tied up and it commences to appear as though the strikers will lose their point. In Portland the same condition of affairs prevails and while there would probably be more work done if there were no trouble on hand, much building is being done. At none of these places are the plumbers directly interested in the strike. In San Francisco there is a noticeable falling off in the erection of large structures and building permits, while calling for a large number of smaller structures, do not total a very large amount. The city is over-supplied with business blocks and office buildings and new buildings of this character are not being erected except in very advantageous locations. Plumbers are fairly busy however, especially the small shops as flats and apartments call for more plumbing work than the other classes of buildings.

Francis J. Baker of the George H. Tay Co., San Francisco is still away but is expected back shortly. The business of the Los Angeles house bearing the same name, and controlled by men interested in the San Francisco concern, is very satisfactory and all Southern California is reported to be sharing in the building activities now being experienced at Los Angeles. Business through the entire farming district of the State is in good shape and as soon as the fruit crop is harvested it is anticipated that there will be a great deal of building commenced.

A marked diminution of defective goods, or "Seconds," is expected to be the result of the new selling arrangement recently entered into by the manufacturers of enameled ware and this will be a source of satisfaction to San Francisco jobbers who have been forced to meet this unfair competition to a more marked degree, perhaps, than have dealers in any other city. It is believed that a greater amount of defective goods has been shipped here than elsewhere and added to this has been large quantities of second hand goods taken from temporary structures erected after the fire. Not content with selling these goods to local plumbers some of the dealers handling this class of supplies have sent men out on the road and have secured no small amount of country trade. With the source of supply cut down, some of these firms will probably retire from the business.

Lacey Bros., 166 Shotwell St., San Francisco, have secured the plumbing contract for work to be done in a three-story frame building being erected by John and Emma Hunter on Seventh street, near Dolores.

Jos. Beck, 1456 O'Farrell street, San Francisco, has secured a contract valued at $750 for plumbing work to be done in a three-story frame structure being erected by Joseph M. Strauss on Clay street, near Devisadero.

A. Davis, 1556 Dolores St., San Francisco, has contracted to install the plumbing in a frame structure, being erected at Twenty-third and Douglas streets, by W. Wieger. The contract is valued at $1,340.

Bids are being received for the plumbing, gas piping and heating work in the attendants' quarters, U. S. Marine Hospital, San Francisco. Contracts will be let some time this month.

Plans are being made for a large public-comfort station at Long Beach, Cal.

The Tetreous-Ehrenman Mercantile Co., Dunsmuir, Cal., which recently took over the plumbing business of E. D. Stewart, has put in a large stock of plumbing supplies and enlarged the business generally.

The opening of the Western Pacific railroad for transcontinental freight and passenger service is looked upon with much interest by San Francisco dealers, and several of them have made arrangements to have a large part of their freight come over the new road. The line affords direct connection with the East by way of Salt Lake City and Denver with wonderful scenic attractions and will also be used by travelers. Several local dealers have signified their intention of making their next trip over the new line to see the new territory opened up.

NEW BUSINESS VENTURES.

The Wechtel Plumbing Co., Toledo, O., has been incorporated with a capital of $50,000 to conduct a plumbing and gasfitting establishment. The incorporators are: H. J. Chittenden, R. M. Marks, Robert Newbegin, M. A. Matthews and G. Andrews.

The Richter Co., Cincinnati, has been incorporated with a capital of $80,000, to conduct a plumbing business. The incorporators are: Edward B. Richter, Louis A. Richter, and Amelia J. H. Richter.

Tumbleson & Branch, Norfolk, Va., have been incorporated with a capital of $5,000 to conduct a plumbing business. The officers are: President, G. T. Tumbleson; vice-president, J. T. Branch; secretary, E. S. Gray; all of Norfolk.

The Independent Plumbing & Heating Co., Seattle, has been incorporated with a capital of $1,000. The incorporators are: A. W. Johnston, H. G. Potter, Charles O'Neal, Eugene Schatzlein and W. K. Jackson.

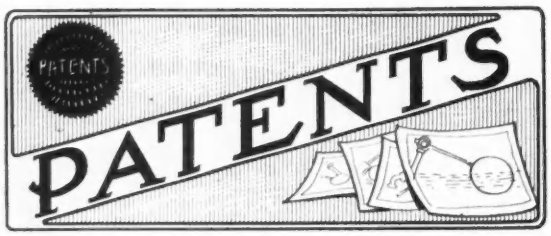
Wm. J. Tucker, Nellie Tucker and Gordon Davies, all of New York City, have incorporated a plumbing and heating business under the name of "John Tucker" with a capital of $5,000.

The J. Sheehan Plumbing Co., St. Louis, Mo., has been incorporated with a capital of $3,000 to conduct a plumbing and heating business. The incorporators are: Jeremiah Sheehan, Jeremiah Sheehan, jr., and Alice C. Sheehan.

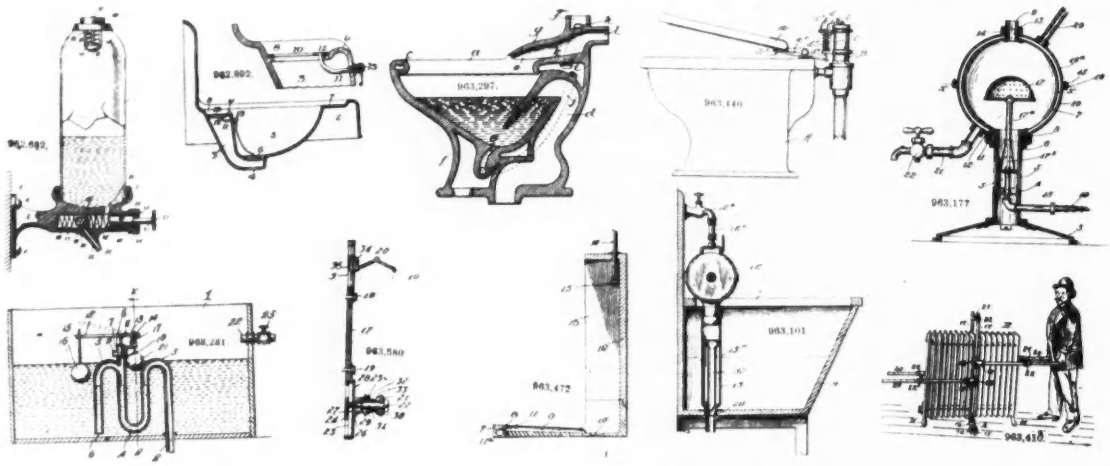
The Blackwood Plumbing Co., Detroit, Mich., has been incorporated with a capital of $2,000. William Blackwood is the principal stockholder.

On account of the anxiety caused by the prevalence of typhoid fever in Milwaukee this summer, the city council has requested Harrison P. Eddy, Boston; John W. Alvord, Chicago; Geo. C. Whipple, New York; to hasten their report on sewage disposal. The sewage of Milwaukee is discharged into Lake Michigan and the water supply is taken from the lake at a distance of 1½ miles from the shore and 60 feet below the surface.

The figures for the first six months of the year, as compiled by Inspector of Plumbing Reuben S. Bemis, Providence, R. I., show that while the building season was a little late in starting this year the amount of plumbing work far exceeds that of previous years. The statistics follows: Plumbing plans, 1019; drain plans, 368; total, 1,387. Of this number 764 were for work in old buildings and 255 in new houses. There were 914 sewer connections made, the estimated value of all plumbing work being $314,553.



962,682. Soap-Dispenser. Charles E. Wade, East Orange, N. J. In a soap dispenser, a receptacle, a base for said receptacle having a pump bore and also a port leading from said receptacle to said bore, a plunger in said bore, means for normally forcing said plunger to its outermost position, a perforated disk having the perforation therein in substantial alinement with the axis of said plunger, a check valve normally closing said perforation, said base having a recess therein in which said valve is disposed, and a downwardly projecting nozzle opening into said recess, said plunger being movable toward said disk and the arrangement of the above recited parts being such that the initial movement of the plunger closes the port from said receptacle, the fluid in said bore being positively ejected by the continued advance of said plunger through said disk and out of said nozzle, in close proximity to the hand of the operator, the axial position of the check valve preventing gumming up of the same by the ejected fluid.



962,765. Flush-Tank. Karl Kohler, Neustadt, Schwarzwald, Germany.

962,892. Lavatory. James H. Danver, Beaver, Pa., assignor to United States Sanitary Manufacturing Company, Pittsburg, Pa., a Corporation of Pennsylvania. A lavatory having an overflow chamber and a recess forming an overflow passage communicating with said chamber, a strainer forming the bottom of the recess, and a bent bolt passing through the strainer with its head engaging the same, the other end of the bolt passing out through the front wall of the overflow chamber to the bowl, and having a detachable securing device, substantially as described. A lavatory having an overflow chamber and a recess forming an overflow passage communicating with said chamber, a strainer forming the bottom of the recess, and a bent bolt passing through the strainer with its head engaging the same, the other end of the bolt passing out through the front wall of the overflow chamber to the bowl, and a chain stay detachably secured to the end of the bolt and forming a securing means therefor, substantially as described.

962,970. Bath-Tub. Pearl Musselman, Billings, Mont.

963,028. Boiler-Alarm. Alexander J. Aderhold, Birmingham, Ala.

963,101. Waste-Pipe for Laundry-Tubs. Gilbert S. Winant, Rochester, N. Y., assignor to Saver Manufacturing Co., New York, N. Y., a Corporation of New York. The combination of a tub having a waste outlet, and a waste pipe located within the tub and leading to the outlet, said pipe being insulated, as from water in the tub. The combination of a tub, an overflow pipe therein leading to a waste outlet in the bottom of the tub, and a waste pipe extending within and spaced from said overflow pipe and leading to said outlet.

963,152. Valve. Charles W. Jones and James A. Gibson, Urbana, Ill.

963,177. Water-Heater. Luther C. Rhea, Columbus, O. A water heater comprising, in combination, two spheres of thin sheet-like metal arranged one concentrically within the other to form a thin sheet-like water chamber between them, tubular bosses connecting said metallic spheres and forming air passages into and out of the inner sphere, a gas burner located within the interior of the inner metallic sphere so as to be surrounded at the sides and above and below by the water chamber, water supply and discharge conductors for the water chamber, and a gas supply conductor for the burner.

963,215. Valve. Lewis Watson Eggleston, Chicago, Ill.

963,221. Faucet. Walter Haynes, Portland, Ore.

963,231. Flush-Valve. James H. Mahoney, Worcester, Mass. In a device of the character described, the combination of a liquid container, a discharge pipe having upper and lower return bends, the upper bend being formed with an upstanding air escape pipe, the latter being cylindrical and containing a valve seat and a laterally projecting outlet above said valve seat, a plunger valve slidable in the upper portion of said air escape pipe and adapted to co-act with said seat and said outlet, a bracket upon said air escape pipe, a lever fulcrumed adjacent one of its ends on said bracket, a link connecting the intermediate portion of the long arm of said lever to said valve, a float carried by the long arm of said lever, a right angular lever fulcrumed at its angle on said bracket and having a short arm projecting upwardly and adapted to swing under the short arm of the first mentioned lever, a float connected to the long arm of the right angular lever, and a stop upon said bracket to limit the swinging movement of said right angular lever.

963,255. Temperature-Regulating System. William A. Sheldon, Marengo, Ill.

963,554. Garbage-Crematory. William K. Herbert, McKeesport, Pa.

963,297. Vented Water-Closet Bowl. John F. Kelly, Trenton, N. J., assignor to Thomas Maddock's Sons Co., Trenton, N. J., a Corporation of New Jersey. A water-closet bowl having a flushing rim, a ventilating duct comprising a hollow integral extension mounted on the upper surface of the bowl at the rear thereof provided with a downwardly directed inlet opening above the rim of the bowl and substantially parallel therewith, a horizontal outlet neck, and a water-supply duct formed in the wall of said extension at the side of said outlet neck.

963,305. Float-Valve. Jesse L. Mayfield, Brenham, Tex.

963,324. Combined Water Filter and Cooler. Aaron F. Randall, Boston, Mass., assignor of one-half to Rhoda E. Ferry, Dorchester, Mass.

963,358. Pumping Apparatus. Xenophon Caverno, Kewanee, Ill.

963,385. Valve. Olaf E. Oleson, Chicago, Ill.

963,403. Stop-Cock. Lyman S. Stacey, Quincy, Mass.

963,410. Truck for Carrying Radiators. Joseph L. Welshans, Chicago, Ill. A truck for handling radiators and analogous articles, comprising an axle, spindles on said axle, and truck-wheels upon said spindles, there being on said axle a series of bosses, posts, removably secured to said bosses, handles, removably secured to said post and projecting laterally therefrom, a connecting-bar upon said posts, said connecting bar being movable upon said posts and adjustable in length, said posts being interchangeable in said bosses.

963,424. Water-Heater. Henry W. Donaldson, Chicago, Ill.

963,440. Seat-Operated Mechanism for Actuating Flushing Devices. John G. Hodgson, Maywood, Ill. The combination with a flushing valve and the actuating element therefor, of a bolt movable obliquely with reference to said valve actuating means and adapted to engage the same at one limit of its movement, coacting cam faces adapted to release the bolt at the other limit of its movement, and a spring engaged on said bolt to force the same toward the valve-actuating means.

963,472. Urinal-Slab. Frank F. Rowell, Scranton, Pa. A urinal floor slab consisting of a base having at one end a drainage opening and having its upper surface inclined toward the drainage opening, said upper surface having a series of ribs directed toward the drainage opening and forming a tread surface, the higher end of the slab being provided with a water chamber adapted to be connected to a source of water supply, said chamber having perforations leading therefrom to the spaces between the ribs, said ribs having a rounded upper edge.

963,498. Pipe Connection. George R. Bard, Chicago, Ill., assignor, by mesne assignments to The Waterworks Specialty Company, Chicago, Ill., a Corporation of South Dakota.

963,580. Hanger for Wall-Radiators. August Kehm, Elmhurst, Ill. In a hanger for wall radiators having horizontal flues, in combination, a plurality of wall plates adapted to be secured to a wall at intervals along the length of the radiator, a vertically-adjustable bracket carried by each of the wall plates, a roller-bearing mounted upon each of said brackets and forming a seat for the lower horizontal flue of the radiator, and a hooked member carried by each plate and engageable with the radiator above its lower horizontal flue.

963,701. Vacuum-Cleaner. Eric Ericsson and Eric G. Thoreen, Worcester, Mass.

963,723. Vacuum Cleaning Apparatus. Edward Wallace Pierce, Philadelphia, Pa., assignor of one-half to Jesse W. Starr, 3d, Atlantic City, N. J.

MILWAUKEE AND WISCONSIN NOTES.

At a recent meeting of the Nekoosa, Wis., school board it was decided to install a new steam-heating plant and ventilating system in the city school. Plans for this work were recently completed.

Al. Cole, Shawano, Wis., has been awarded the contract for installing a new steam-heating plant in the factory of the Upham & Russell Co., Shawano.

With the thermometer close to the hundred mark and while people declared that there was only one place that could possibly be any warmer, a water-pipe froze up at the Lake View Hotel, Sheboygan, Wis., recently. Somewhat doubtful of the sanity of the person who called them up over the telephone, M. Vowinkle & Son, plumbers, sent a man to overcome the difficulty. After an investigation it was found that a part of the pipe ran on top of the ground and that the iceman, in unloading the hotel's order of ice, had covered the pipe to such an extent that the water in the pipe was chilled enough so that it froze. With the aid of a pair of ice-tongs and the help of Old Sol, the trouble was soon remedied.

The office of plumbing inspection will soon be created at West Allis, Wis. The plumbing inspector will be appointed by the mayor with the approval of the common council, which will fix the inspector's salary. Henry Zehren and Arthur Johnson have been mentioned as the most suitable candidates for the new position.

CAPITOL BOILERS AND RADIATORS

"Capitol" Signifies Quality

The name "Capitol" on boilers or radiators has always meant "quality." There are on Capitol Boilers features of exclusive merit to both the heating contractor and the consumer. The dealer not only gives his customers the highest value, but is enabled to give a more satisfactory job at a decided saving in installation cost.

Capitol Radiator designs are distinctive. Both the Florentine and Puritan designs are decided ornaments to any building. They are conservatively rated and give fullest efficiency under all circumstances. Made in all heights and sizes and specialties.

Catalog mailed on request.

United States Heater Company.

BRANCHES:
DETROIT 139 Jefferson Ave.
NEW YORK 200 Fifth Ave.
CHICAGO 34 Dearborn St.
OMAHA 916 Farnam St.

General Offices and Works:
Fort St and Campbell Ave.
DETROIT, MICH.

SALES AGENCIES:
MINNEAPOLIS, MINN., Plumbing & S. F. Supplies Co.
ST. LOUIS, MO., L. M. Rumsey Mfg. Co.
DENVER, COLO., Kellogg & Stokes Stove Co.
DULUTH, MINN., Duluth Plumbing Supplies Co.

Classified Advertisements

Advertisements under this heading 4 cents per word per issue, address included. Remittance to be made with order. To insure insertion copy should be received not later than Wednesday morning.

Situations Wanted

WANTED—POSITION AS SALESMAN. Have had eight years' experience in plumbing and heating field. Address No. 351, "Domestic Engineering," Chicago.

WANTED—POSITION AS BUYER AND Sales Manager or Branch Manager in wholesale plumbing and heating supply line, by man now employed in similar position on the Pacific Coast. Prefer eastern city. Address No. 339, "Domestic Engineering," 325 Dearborn St., Chicago.

SITUATION WANTED—SALESMAN OF fifteen years' experience in plumbing and heating goods would like to connect with good jobbing house or manufacturer of plumbing goods; good reference. Address 355, "Domestic Engineering," Chicago.

Help Wanted.

WANTED—STEAM FITTERS. Address Trades Employers' Free Employment Bureau, Builders' Exchange, Cleveland, O.

UNION PLUMBERS WANTED IN ST. Louis. Come at once, plenty of work. The Association of Master Plumbers, 302 Benoist Bldg., St. Louis, Mo.

WANTED—MAN CALLING ON ARCHITects in New York City or any other large city in the United States to represent as a side line an article of plumbing that will not conflict with anything he is now handling. Address No. 365, "Domestic Engineering," Chicago.

For Sale

FOR SALE—PLUMBING BUSINESS complete. Address J. J. Marshall, Fort Scott, Kan.

FOR SALE—INTEREST IN HARDware, plumbing and heating, in Central New York. This is an excellent opportunity. Address No. 357, "Domestic Engineering," Chicago.

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